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ABSTRACT

This report presents existing workforce levels, training programs and career potentials and develops staffing level projections (1976-1982) based on available information for the State of South Carolina. The study concerns itself with the environmental pollution control areas of air, noise, potable water, pesticides, radiation, solid waste, wastewater, and energy. The format includes workforce profiles, projections, growth and career options for each of the areas investigated. Additional sections of the report outline state legislation and selected post secondary institutions with formal Environmental/Energy programs. A state profile and summary is included for cross-reference. The selected bibliography is appended in the Region IV report. This document is one in a series of 69 which presents information for each of the states, Washington, D.C., Puerto Rico, and the Virgin Islands, and national and regional summaries. (CS)

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ED147155

A National Environmental/Energy Workforce Assessment

SOUTH CAROLINA

U S DEPARTMENT OF HEALTH,
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NATIONAL ENVIRONMENTAL/ENERGY
WORKFORCE ASSESSMENT

for

SOUTH CAROLINA

Conducted by:

NATIONAL FIELD RESEARCH CENTER, INC

Under Grant from:

UNITED STATES

ENVIRONMENTAL PROTECTION AGENCY

Grant #T900591010
1977

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National
Field
Research
Center, Inc.

Box 287
Iowa City, Iowa 52240
(319) 351-8789

INTRODUCTORY NOTE

The National Environmental/Energy Workforce Assessment was conducted by National Field Research Center, Inc. with main offices in Iowa City, Iowa. The following personnel have had primary responsibility for the Assessment and project report.

IOWA CITY, IOWA
  Dr. Darold E. Albright, President
  Paul E. Bridges, Executive Director
  Dr. Richard L. Benesh, Project Director
  Judith J. Gordon
  Alan M. Stowell
  Anita M. Stowell
  Mary Kay (Edge) Wade

ATLANTA, GEORGIA
  Elizabeth G. Nielsen, Regional Director
  Robert Oxberger

DENVER, COLORADO
  Nancy C. Dillenberg, Regional Director

SEATTLE, WASHINGTON
  Steven Silva, Regional Director

WASHINGTON, D.C.
  Frank E. Smith, Project Coordinator
  Lloyd B. Chaisson, Assistant Project Coordinator
  Jack F. Seum

Additional research and clerical assistance was provided by Frederick M. Wall, Maxine Wolfe, Margaret Fehn, Sandra Hogsed, Karen Kirchoff, Sharon Leiker, Marilyn Low, Mary McCormac, and Joan Urquhart.

FIELD OFFICES

ATLANTA
2700 Cumberland Pkwy
Suite 150
Atlanta, GA 30339
(404) 433-2644

DENVER
2600 S. Parker Rd.
Suite 160, No. 6
Denver, CO 80232
(303) 751-4962

SEATTLE
927 United Pacific Bldg.
1000 2nd Ave.
Seattle, WA 98101
(206) 623-9170

WASHINGTON, D.C.
1522 K Street, N.W.
Suite 600
Washington, D.C. 20005
(202) 223-9138

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PREFACE

This report presents existing workforce levels, training programs, and career potentials and develops staffing level projections (1976-1981) based upon available information for the State of South Carolina in the environmental pollution control areas of air, noise, potable water, pesticides, radiation, solid waste, waste water, and energy. This study was carried out for the United States Environmental Protection Agency by National Field Research Center of Iowa City, Iowa.

The information and data presented in this report were compiled in large part from extensive interviews with professionals working in the respective areas and were supplemented by telephone surveys and research.

FOREWORD

The material included herein contains the information and data collected for eight individual pollution control inventories conducted for South Carolina. The format includes workforce profiles, projections, growth and career potential for each of the areas investigated. Growth projections are necessarily best professional estimates developed from available information and represent what are felt to be realistic figures by experts in the respective areas. The pollution areas considered by this study are as follows:

Air
Noise
Pesticides
Potable Water
Radiation
Solid Waste
Waste Water
Energy

National Environmental Energy
Workforce Assessment

Phase I

SOUTH CAROLINA

State Summary

I. AIR

The South Carolina Department of Health and Environmental Control (DHEC) is responsible for implementing the state's air pollution control program, which is authorized by the Pollution Control Act of 1970. DHEC employs 65 persons for air pollution control, both in its central office in Columbia and in the agency's twelve district offices. These include 13 engineers, 28 scientists, 7 technicians and 17 managers and clerical personnel.

State officials estimate that there are currently approximately 400 individuals working in industries throughout the state in air pollution control. The majority are engineers, although scientists and technicians are also utilized. In addition, there are approximately ten consulting firms in the state that service the field.

DHEC appears to be adequately staffed in air to address required functions. Limited growth is expected and while the number of engineers may slightly decrease, the number of technicians and scientists is expected to increase approximately 4% annually. For the private sector, sources project that the number of personnel in industries will moderately increase, with demands for engineers and technicians.

The greatest problem identified within the department is the inability to send personnel to technical courses. This is due to EPA tuition charges coupled with state budgetary controls. DHEC's participation in the Southeastern Air Pollution Control Training Committee, developed by the Region IV EPA, assists in providing needed training to personnel.

II. NOISE

Noise control efforts in South Carolina take place in the South Carolina Department of Health and Environmental Control. In relation to environmental noise, the function is largely consultative, as no statewide noise legislation is in effect. DHEC has promoted local noise ordinances, and provides information to local officials for establishing regulations. Consultation is also carried out with industries regarding the control and abatement of environmental noise.

Within DHEC, one person works part-time in environmental noise. A possibility exists that regulatory legislation will be passed within the next five years. A nominal staff of eight would be formed, preferably with six professionals who have had previous experience in the field. Eventually the total staff would increase to 26, with twelve in the headquarters office, and fourteen in the Department's district offices. Sanitarians of County Health Departments would be trained to provide enforcement. Most or all of the state's 46 counties would also probably require noise control officers.

While workforce increases may occur in the public sector and possibly in the private sector, sources indicate that persons with any training and/or experience in the field are not readily available. It may also be that engineers with master's degrees will be in greatest demand, especially those with experience in the field.

III. PESTICIDES

The Division of Regulatory and Public Service Programs of Clemson University implements the State's Pesticide Control Act. Cooperation is received from the Department of Health and Environmental Control, the Cooperative Extension Service and the Aeronautics Commission. Within these agencies are approximately 81 professionals, chiefly from agricultural backgrounds that service the field, most on a part-time basis. In addition, 140 county agents provide training to private applicators.

As of November 1, 1976, approximately 2,158 commercial applicators were certified out of an estimated 3,850 that will require certification by October 21, 1977. On November 1, 754 private applicators had been certified out of an estimated total of 35,000-40,000 requiring certification. The number of pesticide dealers requiring licensing is estimated to be from 1,000 to 2,000.

In the public sector, workforce levels are not expected to increase except in the area of investigation, which would require persons with agricultural backgrounds. The growth rate for commercial applicators is projected to be 5% per year except in the category of Industrial, Institutional, Structural and Health Related Pest Control, which is expected to grow 10% annually. Greater needs are projected for graduate level persons with expertise in the field.

Applicator training is conducted by the Cooperative Extension Service. The training rate will necessarily decline after 1977, but the nature of the training will not be changed.

IV. POTABLE WATER

The South Carolina Safe Drinking Water Act of 1976 is implemented by the Department of Health and Environmental Control (DHEC), which currently employs 40 people for potable water. The state has recently assumed primacy for the Federal Safe Drinking Water Act and as a result, an additional 21 people are projected to be added to the program by 1982, specifically sanitary and environmental engineers, geologists, chemists, biologists and technicians.

The state operates a mandatory certification program for operators of water treatment plants. During 1976, 1,179 certificates were issued to plant operators, three to inspectors, and three to laboratory technicians. Sources predict that there will be 100 technicians by 1982 as well as 4 inspectors and approximately 1,500 plant operators.

Training for plant personnel is available in several forms. Currently available are an associate degree program, an eighty-hour upgrade program, a correspondence course from Clemson University and periodic short schools. While these programs are felt by DHEC officials to provide adequate training, a problem lies in the number of students that can be accommodated. Through available training modes, it is not anticipated that the projected annual new entry training requirements for 50-100 operators and for the upgrade of 200-300 operators can be met. DHEC is also concerned about the lack of technical training currently available to its own potable water personnel.

V. RADIATION

Radiation control functions in South Carolina take place in the Department of Health and Environmental Control (DHEC). South Carolina is heavily impacted with nuclear facilities, which are monitored by DHEC. The Department also licenses materials and machines. Twenty persons in DHEC are involved in radiation control: two nuclear engineers, fifteen health physicists and three secretaries.

Nuclear facilities employ staffs for radiation control, and data indicate that there will be 20 health physicists employed by these facilities in the state, as well as 100 health physics technicians. Sources are aware of two medical facilities that employ radiation physicists. Sources also estimate that 20 radiochemists perform related analytical work in the state.

The DHEC may increase by three health physicists during the next five years. In addition, available data indicate that there may be an increase of five to ten health physicists and 60 to 80 technicians in nuclear facilities and that there may be 10 radiation physicists for medical facilities by 1982. The number of radiochemists is not expected to increase.

Persons trained in these professions are currently not readily available, although there are several curricula in the state for training technicians. Professionals voice the feeling that a great need exists for expansion of institutional training programs for training health physicists, radiation physicists and, to a lesser extent, for radiochemists and nuclear engineers.

VI. SOLID WASTE

The Department of Health and Environmental Control (DHEC) implements South Carolina's solid waste program. This agency will be responsible for carrying out the provisions of the Resource Conservation and Recovery Act of 1976. While 29 persons now work in solid waste in DHEC, this number will of necessity increase. Preliminary projections provide for an increase of ten positions by 1979, and most personnel will continue to be engineers and scientists, many preferably with expertise in hazardous materials and resource recovery.

According to state sources, there are approximately 292 persons in the state involved in solid waste disposal: 232 landfill operators, 4 weighmasters, 39 foremen and 17 spotters. There are no designated hazardous waste disposal facilities and most resource recovery takes place in the private sector. Sources predict that the number of landfill operators will increase by ten during each of the next five years, and numbers of other disposal personnel will increase at a similar rate. Workforce increases in the areas of hazardous waste management and resource recovery cannot yet be accurately predicted.

Technical upgrade opportunities for DHEC solid waste personnel are extramely limited. To partially fill the void, Region IV EPA has formed a solid waste training committee in which DHEC personnel participate. The agency currently carries out informal training for landfill personnel and hopes to develop an operator certification program in the future.

VII. WASTEWATER

The Department of Health and Environmental Control (DHEC) implements South Carolina's wastewater program. Presently approximately 145 persons in DHEC work in wastewater. Officials do not foresee a need for significant workforce increases within the next five years. Engineers, scientists and technicians fill the majority of the positions although technicians may find more job opportunities in the future.

The state implements a mandatory certification program for wastewater treatment plant operators. During 1976, 2,380 certificates were issued to operators of wastewater treatment plants, 15 persons were certified as inspectors and 24 were certified as laboratory technicians. State sources project an annual requirement of 200 entry level operators and, although the majority will continue to be in lower grades, a slight upward shift may occur. Within two years, an estimated 500-600 certified laboratory technicians will be required and the number of inspectors will slightly increase.

A variety of training opportunities is available to plant personnel, including an associate degree program, an eighty-hour upgrade program, correspondence courses, short schools and an NPDES training program. Sources believe that these programs offer adequate training but may not be able to accommodate the required number of students. DHEC officials are also concerned that the agency's personnel are not able to attend technical training at the required level because of state budget limitations.

VIII. ENERGY

The South Carolina Energy Management Office is the state's chief coordinating agency in the energy field, and will implement an energy conservation program under the provisions of the Federal Energy Policy and Conservation Act. The office employs a director and eight other professionals including statisticians, engineers and administrative personnel. For implementing the Act, three additional professionals will be required.

A Nuclear Advisory Council is responsible for assuring that the nuclear industry does not have a detrimental effect on the state's citizenry. The Council has eleven members, one of whom is a full-time staff person. One more staff person may be required within the next five years.

Impact of the conservation program is expected to occur in the private sector. Highly skilled architects, engineers and scientists will be required to assist in meeting the mandates of the Act. Few opportunities appear to be emerging for technician level personnel in the field of energy except for those trained in power plant management.

State professionals believe that an important component of energy conservation programs is public awareness and education. Home-owner energy saving workshops have been held throughout the state and plans are underway to provide energy conservation workshops to school children.

STATE OF SOUTH CAROLINA - SUMMARY

National Environmental/Energy Workforce Assessment
Pollution Control & Abatement Personnel
Projected Workforce Requirements (1976-1981)

Environmental Area	1976	1977	1978	1979	1980	1981	%/annum growth (average)
AIR[1]	65	65	69	69	73	73	2%
NOISE[2]	1					26	n/a
PESTICIDES[3]	231	232	233	234	235	236	1%
POTABLE WATER[4]	1,225	1,317	1,411	1,496	1,580	1,665	6%
RADIATION[5]	161	179	197	215	242	253	10%
SOLID WASTE[6]	321	338	356	371	384	396	3%
WASTEWATER[7]	2,564	2,989	3,441	3,741	3,943	4,142	10%
ENERGY[8]	10	13	14	14	14	14	7%
TOTALS	4,578	5,133	5,721	6,140	6,471	6,805	8%

[1] Includes the state agency. Slight growth is also expected in the private sector.

[2] Includes the state agency, and is based upon the assumption that statewide noise legislation will be passed. If this occurs, workforce increases would probably occur at the local level and in the private sector.

[3] Includes public agency personnel. Does not include an estimated 3,850 commercial applicators, 35-40,000 private applicators and 1-2,000 dealers. One commercial category (structural) is expected to grow 10% annually, while all others are expected to grow 5% annually.

[4] Includes state personnel and certified inspectors, operators and lab technicians.

[5] Includes the state agency and the estimated workforce of the private sector.

[6] Includes state personnel and disposal personnel.

[7] Includes state personnel and certified operators, lab technicians and inspectors.

[8] Includes the Energy Management Office and the Nuclear Advisory Council. Private sector figures are unavailable, although increased needs are projected for skilled engineers, architects and scientists.

EDUCATION

Clemson University offers master and doctorate level degree programs in Environmental Systems Engineering. This curriculum was first offered in 1961, and programs are offered in the following areas: Water Treatment Systems, Natural Systems, Planning and Management, Environmental Science, Air Pollution and Environmental Systems Engineering.

Sumter Area Technical College offers a two-year curriculum and degree in Environmental Engineering Technology. Courses are offered in such areas as air and water pollution, solid waste, sanitation, industrial waste and water quality and wastewater engineering.

An Associate in Applied Science degree in Chemical Technology is offered by the Greenville Technical College. Students study the fundamentals of inorganic chemicals, the reactions between chemicals and the production of consumable products from other chemicals. An Associate degree in Wastewater Technology is also offered, in which students study ecology, chemistry, unit operations, hydraulics, supervison and government.

Trident Technical College, the Aiken Technical Education Center and the Tri-County Technical Education Center offer two-year curriculums in the nuclear field. Programs are designed to train students to be technicians in the nuclear industry, and among the courses offered is radiological safety.

LEGISLATION

The environmental/energy legislation for South Carolina was obtained by request from various agency personnel and through various library references. Summaries of the legislation deemed most relevant to the eight subject areas of the workforce assessment were prepared, and are included in the respective state reports. The following list of laws represents virtually all environmental legislation for the state. Only certain of the following laws were summarized; the list is presented to show, by title, the kinds of laws which have been enacted.

Pollution Control Act of 1970
Pesticide Control Act
State Safe Drinking Water Act
Atomic Energy and Radiation Control Act
Operator Certification Law

National Environmental Energy Workforce Assessment

Phase I

SOUTH CAROLINA

State Report

STATE PROFILE

South Carolina is located in the Southeastern United States, and with its 31,055 square miles, is the 40th largest state in the United States. South Carolina's population in 1974 was 2,784,000, of which approximately 45 percent lived in metropolitan areas.

In the northwest portion of the State are the Blue Ridge mountains, which slope to thick pine forests and fertile farmlands. The State also contains 187 miles of coastline to the east, with semi-tropic beaches. The average annual temperature in the State is 63.5 degrees, while annual precipitation averages 49 inches.

South Carolina contains two metropolitan areas with populations of over 250,000: Columbia and Greenville-Spartanburg. Other major cities include Charleston and Rockhill. The State's population has exhibited a trend from the rural to the urban, mirroring the shift from an agricultural- to an industrial-based economy. Industrialization is increasing, and the State's factories currently produce approximately eight times the output of farms in cash value.

Significant amounts of agricultural activity still occur in the State, and important commodities include peaches, soybeans, cotton, corn, sweet potatoes, tobacco and peanuts. The State is also a chief producer of turkeys, chickens and eggs. South Carolina is a leader in the production of vermiculite, kyanite and kaolin. A significant amount of lumber is harvested for pulp and saw timber.

The textile industry is the most important industry in the State. Other manufactured products include chemicals, apparel, paper, food products, machinery and stone-clay-glass products.

Officials of South Carolina's State Development Board report that through the end of November, 1976, the State had drawn $426.7 million worth of new industrial investments, $186 million of it from foreign lands. This amount is less than the Board had hoped. Board members feel that until retail-consumption accelerates on the part of the national economy, South Carolina will continue with the lingering effects of recession. South Carolina continues to be locked in the rank of 49th in the union in per capita income. Through 1976, however, the State improved its position relative to the nation by reducing its unemployment. In early 1976, the State's unemployment rate averaged 7.1% as compared to the nation's 7.8%. The State continued to experience a reduction in the unemployment rate. By November the rate had decreased to 5.8% while the national rate had risen to 8%.

SOUTH CAROLINA POLLUTION CONTROL AND ABATEMENT AGENCIES

The South Carolina Department of Health and Environmental Control is the principal State environmental agency. Environmental activities take place in both the Environmental Quality Control and the Environmental Health and Safety components of the Department. Additional State agencies or organizations concerned with environmental protection include the Division of Regulatory and Public Service Programs of Clemson University, the Cooperative Extension Service, the South Carolina Aeronautics Commission, the State Energy Management Office, and the Nuclear Advisory Council.

In the Department of Health and Environmental Control, the air, potable water, solid waste and wastewater activities are carried out in the Office of Environmental Quality Control. Within the Office are four bureaus. The Bureau of Air Quality Control is responsible for the assurance and maintenance of air quality in South Carolina. A permitting process is utilized for enforcement of State legislation, technical assistance is provided, and air monitoring is performed. In addition, this Bureau administers the State Air Implementation Plan developed under the mandates of the Federal Clean Air Act. The Bureau of Wastewater and Stream Quality Control holds chief responsibilities for the control of water pollution in the State. Activities are primarily carried out through NPDES permitting, and planning as specified in the Federal Water Pollution Control Act.

Also within Environmental Quality Control, the Bureau of Special Environmental Programs houses the State's potable water and solid waste programs. The Water Supply Division will attempt to assume primary enforcement responsibilities of the Federal Safe Drinking Water Act. The Solid Waste Management Division utilizes a permitting process to control solid waste disposal practices; activities will increase due to the passage of the Federal Resource Conservation and Recovery Act. This Bureau also houses a program for assuring the safety of the State's shellfish and recreational waters.

Finally, the Bureau of Field and Analytical Services of Environmental Quality Control provides district services and laboratory support to the Department's potable water, wastewater, solid waste, and shellfish programs. Services may in the future expand to include other environmental areas.

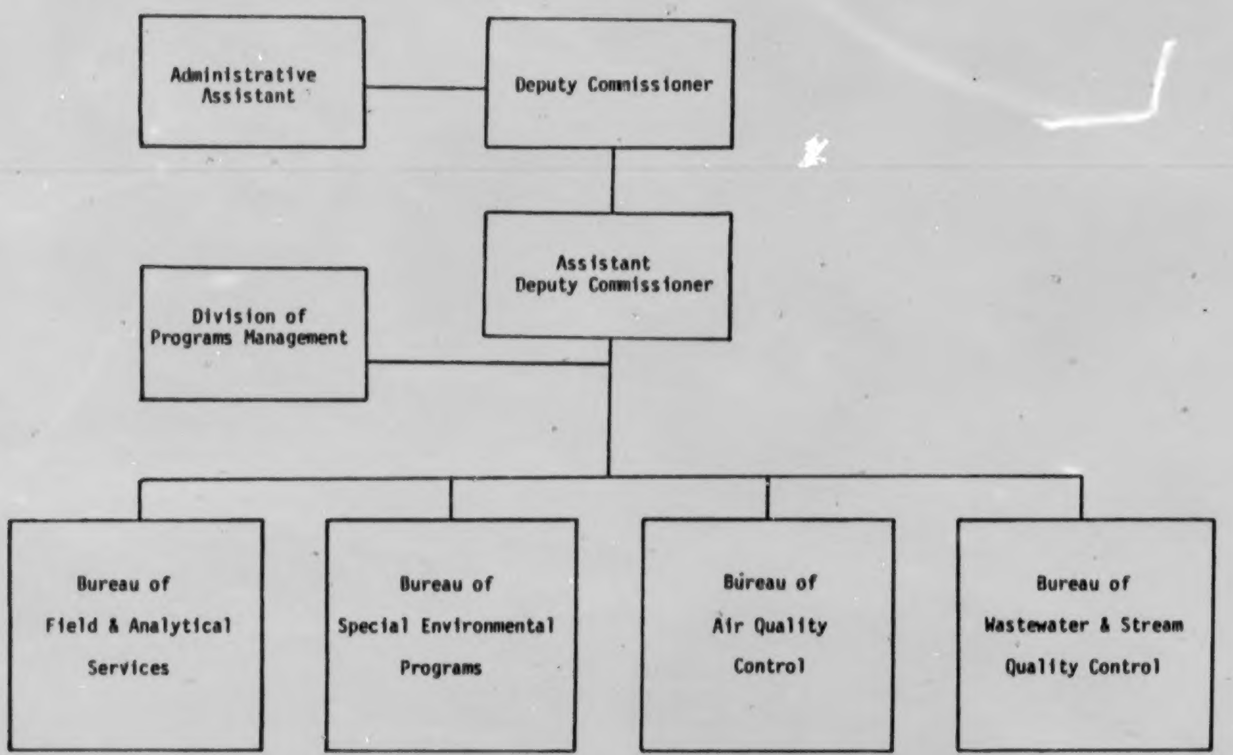
The Environmental Health and Safety component of the Department holds chief responsibilities for the State's radiation and noise programs. With regard to noise, consultation and technical assistance are provided to communities and private industry, and promotion of passage of State environmental noise legislation takes place. The Bureau of Radiological Health performs environmental radiation monitoring, conducts an X-ray regulatory registration program, issues licenses to users of all radioactive materials, and inspects sources of non-ionizing radiation, among other related activities. Environmental Health and Safety also provides services in pesticides control.

The Division of Regulatory and Public Service Programs at Clemson University regulates the registration, quality, sale, distribution and use of pesticides. This Division certifies applicators of restricted pesticides. The Cooperative Extension Service is responsible for the training of pesticides applicators, while the Aeronautics Commission licenses aerial applicators in accordance with the requirements of the Division of Regulatory and Public Service Programs.

The South Carolina Energy Management Office is performing preliminary data collection in support of the development of an energy conservation program under the provisions of the Federal Energy Policy and Conservation Act. The Nuclear Advisory Council has the responsibility of assuring that the nuclear industry does not have a detrimental effect upon the State's citizenry.

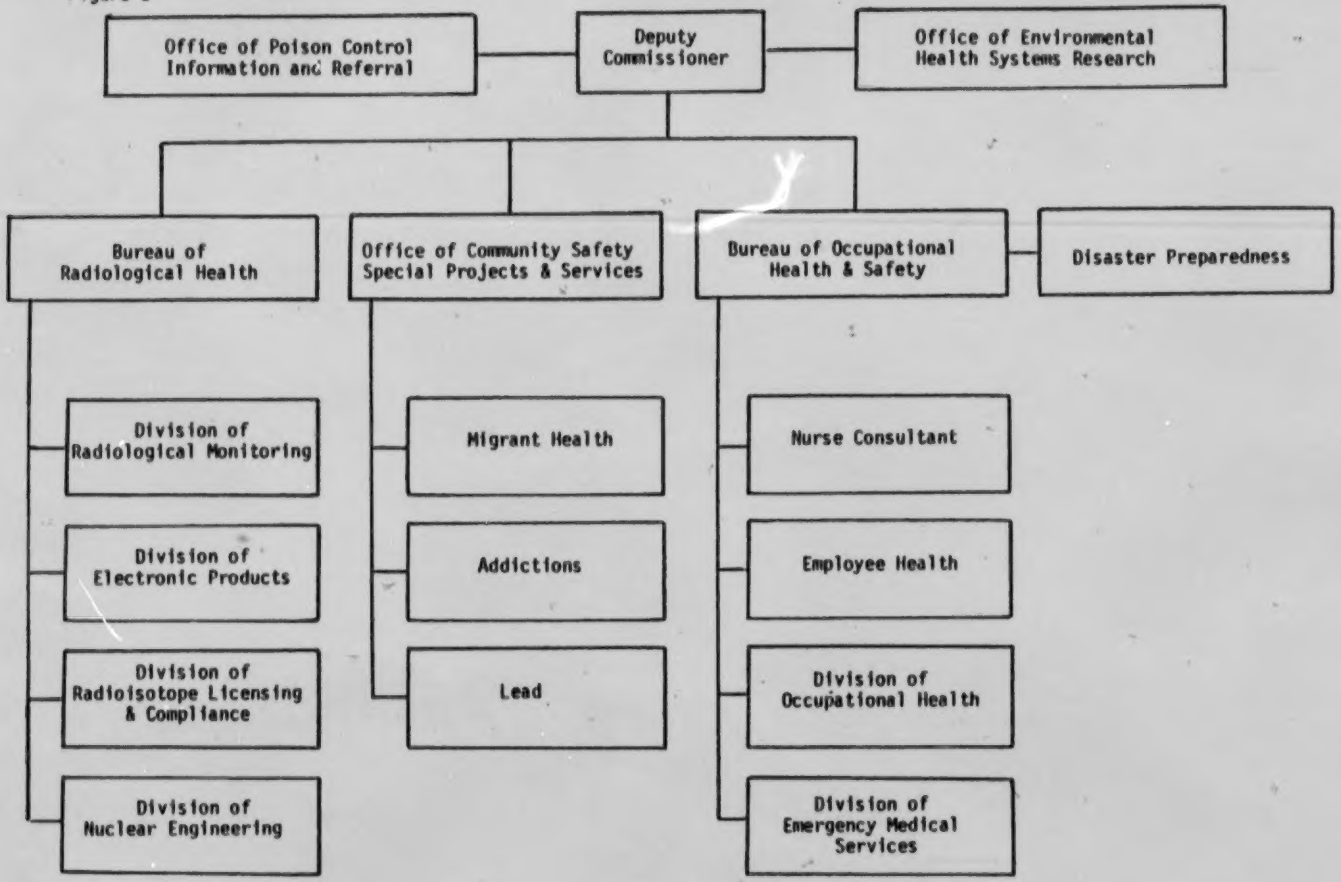
SOUTH CAROLINA DEPARTMENT OF HEALTH AND ENVIRONMENTAL CONTROL

Figure 1 OFFICE OF ENVIRONMENTAL QUALITY CONTROL


Administrative Assistant
Deputy Commissioner
Assistant Deputy Commissioner
Division of Programs Management
Bureau of Field & Analytical Services
Bureau of Special Environmental Programs
Bureau of Air Quality Control
Bureau of Wastewater & Stream Quality Control

SOUTH CAROLINA DEPARTMENT OF HEALTH AND ENVIRONMENTAL CONTROL - ENVIRONMENTAL HEALTH AND SAFETY

Figure 2


Deputy Commissioner
Office of Poison Control Information and Referral
Office of Environmental Health Systems Research
Bureau of Radiological Health
Office of Community Safety Special Projects & Services
Bureau of Occupational Health & Safety
Disaster Preparedness
Division of Radiological Monitoring
Division of Electronic Products
Division of Radioisotope Licensing & Compliance
Division of Nuclear Engineering
Migrant Health
Addictions
Lead
Nurse Consultant
Employee Health
Division of Occupational Health
Division of Emergency Medical Services

Pollution Control and Abatement Programs

I. AIR

A. Introduction

Responsibility for South Carolina's air pollution control program is charged to the State Board of Health and Environmental Control by Act 1157, the Pollution Control Act of 1970, as amended by the 1971-1972 General Appropriations Act. Implementation and enforcement of the program are carried out by the Environmental Quality Control component of the Department of Health and Environmental Control.

Enforcement of the Act is carried out by issuing construction and operation permits to facilities that discharge air contaminants or utilize devices for the control of air contaminants. Emission standards for sources have been adopted by the Board, as have ambient air standards. Open burning is prohibited in the State by the Act, except under certain specified conditions. In addition, regulations have been developed that are designed to prevent the excessive build-up of air pollutants during air pollution episodes. These regulations stipulate criteria for the definition of four air pollution episode levels, and specify emission reduction requirements for each level. "Hazardous conditions" are also defined and controlled.

According to State sources, although the air pollution program as a whole has proven to be viable and effective, a problem occurs in the control of odors, and there are no specific regulations for odor control. Research will be performed regarding procedures used by other states in this regard.

B. Workforce Profile

Within the Environmental Quality Control office of the Department, the Bureau of Air Quality Control is responsible for the development and implementation of a State Air Implementation Plan for the attainment and maintenance of ambient air quality standards. The Bureau is divided into four Divisions. The Division of Planning and Development prepares and updates the State Implementation Plan and continually evaluates and analyzes the results of the various provisions of the Plan, while the Facilities Evaluation Division evaluates applications for new construction, material alteration or additions to existing sources and issues construction permits and operating permits where warranted. This Division also performs periodic engineering evaluations of new and existing sources.

The Monitoring and Enforcement Division carries out surveillance activities through visual observation and in-plant inspections to ensure that sources maintain compliance with applicable regulations and standards, and prepares enforcement cases and actions for non-compliance. The Division of Analytical and Data Services maintains a statewide air quality surveillance network which continually monitors the ambient air to determine compliance with standards.

Approximately 23 persons in the Bureau of Air Quality Control work in the district offices, while the remainder are located at headquarters in Columbia. District personnel assist the Facilities Evaluation Division in most of the stack sampling that is required, and set up special monitoring stations when needed. District offices are maintained at the following locations:

District	City
Appalachia I	Anderson
Appalachia II	Greenville
Appalachia III	Spartanburg
Catawba	Lancaster
Central Midlands	Columbia
Low Country	Beaufort
Lower Savannah	Aiken
Pee Dee	Florence
Trident	Charleston
Upper Savannah	Greenwood
Waccamaw	Myrtle Beach
Wateree	Sumter

The following table represents the total numbers of persons currently employed in the Bureau of Air Quality Control, both in the district offices and at Headquarters, in Columbia.

TABLE I

SOUTH CAROLINA DEPARTMENT OF HEALTH AND ENVIRONMENTAL CONTROL

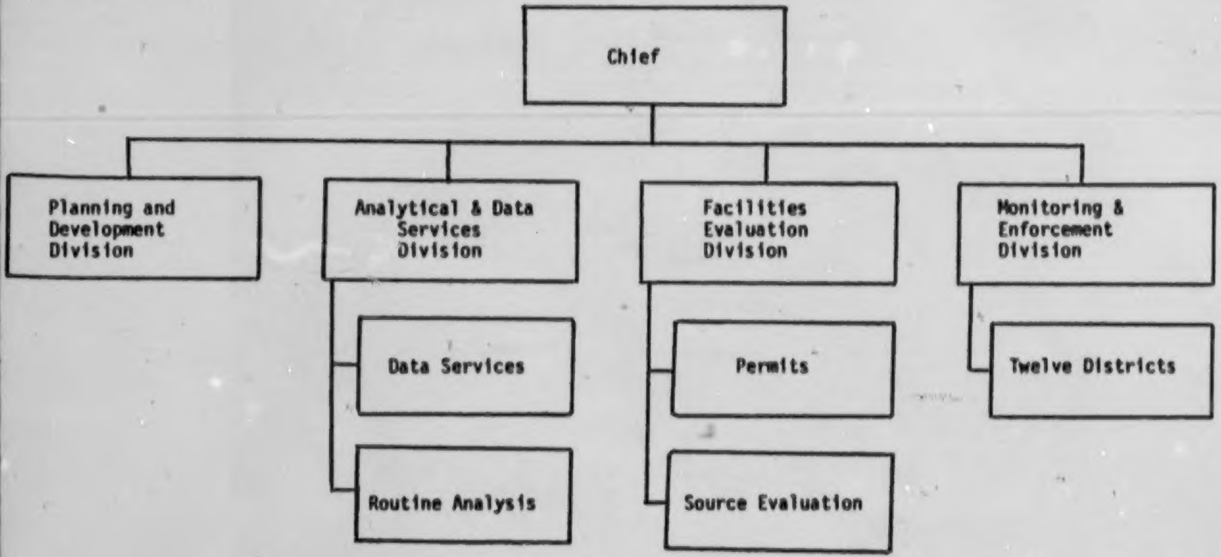
Bureau of Air Quality Control
Current (1976) Staffing Level

Position	1976
Engineer	13
Scientist	28
Technician	7
Other	17
TOTAL	65

Within the category of "scientist" are included seven laboratory chemists and 18 "environmental quality managers" that have at least bachelor level degrees in physical science areas, such as chemistry, biology and microbiology. The "other" category includes 12 environmental quality managers that have degrees in non-physical science areas, and five clerical

SOUTH CAROLINA DEPARTMENT OF HEALTH AND ENVIRONMENTAL CONTROL
OFFICE OF ENVIRONMENTAL QUALITY CONTROL
BUREAU OF AIR QUALITY CONTROL

Figure 3


Chief
Planning and Development Division
Analytical & Data Services Division
Facilities Evaluation Division
Monitoring & Enforcement Division
Data Services
Routine Analysis
Permits
Source Evaluation
Twelve Districts

employees. Most technicians come from two-year technical schools or have had coursework in four-year institutions.

During 2976, South Carolina contained 239 major installations, or facilities capable of emitting over 100 tons of pollutants each year. This represents approximately 5% of all major installations in Region IV. On June 30, 1976, all but three of these were in compliance with respect to emission limits and/or compliance schedules.

A large portion of the total sources in the State are textile mills, although permits are also issued to such operations as pulp, paper and paperboard mills, industrial chemical plants, and stone, clay, glass and concrete manufacturing plants. Such industrial operations as grain dryers, commercial tobacco grinding and drying operations, incinerators and cotton gins also require efforts to keep air emissions within prescribed limitations.

According to State professionals, larger industries in the State such as many of the textile mills, retain their own engineering staffs at corporate headquarters offices, not located in South Carolina, although many may have one staff professional at the plants to deal with all pollution control problems. On occasions, for larger pollution control problems, these industries may solicit the services of private consulting firms. Medium-sized industries generally hire private consulting firms to deal with air pollution problems, although some do retain some type of technical capability on their own staffs. The smaller industries, such as the cotton gins, rarely have personnel on staff that understand air pollution control requirements. In these cases, the State personnel give general advice by explaining regulations and directing attention to the methods that similar companies have utilized for successfully meeting air pollution standards. State sources indicate that within the State, generally industries do not employ persons full-time for air pollution control. Those that participate in the maintenance of equipment, testing, and other related functions range from highly skilled engineers to technician-level personnel. Only the very large industries have their own testing capabilities.

State officials estimate that there are currently approximately 400 individuals working in industries throughout the State in air pollution control. The majority of these persons are engineers, although a portion would be scientists and technicians. In addition, there are approximately ten consulting firms in the State that service the field of air pollution control. Each firm averages approximately two-and-one-half engineers for air pollution control functions.

C. Workforce Projections

Staffing levels within the Bureau of Air Quality Control are not expected to increase dramatically within the next five-year period because the program is fairly adequately staffed at the present time to carry out all needed responsibilities. Changes that do take place will mostly occur as a result of shifts in priorities between programs. A greater interest in operation, maintenance and ongoing performance, rather than in grants, planning and the development of programs is projected to occur. According to sources, the Bureau may grow by approximately two percent annually during the next five years.

Turnover within the Department has decreased since Fiscal Year 1975. The decrease is attributed primarily to the upward adjustment of pay scales in 1973, the offering of post-graduate educational opportunities to employees on an expanded basis, and the economic recession. At the present time, the annual turnover rate has been ranging from six to 25 percent, and averaging ten percent, varying with occupational level. Most types of employees are currently easier to recruit than they have been previously.

The following table depicts future workforce levels within the Bureau, as projected by professionals in the Office of Environmental Quality Control.

TABLE II

SOUTH CAROLINA DEPARTMENT OF HEALTH AND ENVIRONMENTAL CONTROL

Bureau of Air Quality Control
Workforce Projections to 1982 (est.)

Position	1976	1977	1978	1979	1980	1981	%/annum turnover (average)	%/annum growth (average)
Engineer	13	13	13	13	11	11	6%	-3%
Scientist	28	28	29	29	32	32	6%	3%
Technician	7	7	8	8	9	9	9%	5%
Other	17	17	19	19	21	21	10%	5%
TOTAL	65	65	69	69	73	73		2%

The growth in the category of "scientist" reflects an increase of three environmental quality managers with degrees in physical science and an increase of one chemist. Within the "other" category, an increase of three environmental quality managers with degrees in physical or non-physical science areas is projected.

D. Training and Certification

The Office of Environmental Quality Control is currently faced with a reduced ability to send personnel to technical courses needed to carry out all required responsibilities. This problem, along with the training

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that is available to Office personnel is described in the Appendix of this report.

Because other Region IV states were also faced with similar training problems, officials of the Region IV Environmental Protection Agency have established and organized a training committee in which representatives from each Region IV state participate. This committee, the "Southeastern Air Pollution Control Training Committee", assesses regional training needs and develops specific courses, making them available to state personnel. South Carolina personnel attended the first course offered, "Control of Particulate and Gaseous Emissions", and plan to participate in future course offerings developed by this Committee.

Professionals in the Bureau of Air Quality Control have determined specific training needs that currently are not being met by any available source. These persons feel the need for courses relating to troubleshooting for monitoring equipment and courses that teach operating characteristics of pollution control equipment. Many of the training courses that are available to personnel teach theory, but very little practical application, and do not assist personnel in keeping up with the latest developments and technologies in the field.

The Bureau of Air Quality Control conducts a smoke school or "eyeball calibration course" approximately six times per year, depending upon the demand. Those individuals within the Department that perform stack sampling are required to become recertified every six months. Industrial personnel are also allowed to attend the course at no charge, although certification is not required. Approximately 25 persons attend the course each time it is offered. During FY 2977, the course will be offered approximately twelve times, as a part of the cross-training program in the district offices.

There have never been any air pollution technician training programs in the State, although attempts to develop such a program have been made by the Office of Environmental Quality Control and a technical education center. State personnel are still attempting to negotiate with a school to develop such a curriculum to serve the public and the private sectors.

E. Career Potential

New types of careers have not been identified within the Bureau of Air Quality Control, although through the cross-training of existing personnel, changes in job descriptions and job functions may occur as a result of the agency's "functionalization" plan (described in the Appendix). In addition, as the agency moves toward the operations and maintenance of existing programs, environmental technicians from sources such as two-year educational programs might well be in greater demand, while the requirements for professionals might decrease. In the private sector, increased engineering capabilities in private consulting firms and in industries is projected. It appears that industries would utilize air pollution technicians to a greater extent if training programs were available.

F. Conclusion

The Bureau of Air Quality Control appears to be adequately staffed to address all current functions, and to a large extent, those of the future. Limited growth is projected, at an approximate average rate of four percent annually. New types of careers are not anticipated to emerge, although employees will gradually become more generalistic as a result of agency cross-training.

A moderate workforce growth in the private sector is anticipated for air pollution control. Requirements will probably be greatest for engineers, although it appears that the use of air pollution technicians by private industry would substantially increase were persons of this type being trained.

II. NOISE

A. Introduction

Noise control efforts in South Carolina take place in the Environmental Health and Safety sector of the South Carolina Department of Health and Environmental Control. In relation to environmental noise, the function is largely consultative, as no State legislation currently exists in this area. The Department has promoted local noise ordinances, and provides information to local officials for establishing regulations. Consultation is carried out with industries and with individuals who are concerned with environmental noise.

The South Carolina Department of Labor is charged with the responsibility of enforcing regulations of the Occupational Safety and Health Act (OSHA). However, this Department contracts with the Department of Health and Environmental Control to enforce those aspects that deal specifically with health.

Two environmental noise bills were introduced in the legislature in 1973, but passage did not occur. Several reasons are that: a) three bills have actually been considered by House committees and differences could not be completely resolved, b) two major industries opposed the passage of a bill, and c) there was insufficient legislative support. In addition, the bills were considered in terms of zoning, which typically meets much opposition. The fact that a bill would have required additional State funds made it more difficult for a bill to be passed.

South Carolina is not highly industrialized, and the State's greatest environmental noise problem is felt to be vehicular noise. A noise bill, however, would hopefully be designed, according to professionals, to deal with the total array of environmental noise problems that could potentially occur.

B. Workforce Profile

Within the Department of Health and Environmental Control, one staff person works part-time in noise control. This person has a master's degree with twenty-five years of experience in the environmental field.

A questionnaire was sent by the Department to towns and municipalities regarding the existence of local ordinances. Fifty percent of those that responded had noise ordinances, but only two had definitive standards: the city of Cayce and Charleston County. As far as is known, Charleston County provides little enforcement. The Department, however, worked with Cayce in the development of its noise program, and a noise measurement device was purchased by the city. However, no training was readily available to those involved, and effectiveness is questionable. Columbia, too, passed a noise ordinance in 1972, making it a misdemeanor to create noise in excess of defined limitations. However, instrumentation and training are lacking. In sum, few noise control efforts are currently taking place at the local level, and enforcement of existing ordinances is lacking.

Although State professionals feel that there is a great need for noise control specialists for in-plant and environmental noise control, this type of person is not readily available. Industries do occasionally contract with private consulting firms, mainly with regard to in-plant noise, but these firms rarely have any real expertise. Reasons given that noise has not been adequately addressed at the industrial level include:

1) It is difficult to find persons with the training to do an adequate survey on noise problems,

2) Once a problem is found, it is difficult to find persons qualified to ameliorate it,

3) Equipment is very expensive,

4) A body of knowledge does not exist in the field of noise as it does in air and water, and

5) Industries are not convinced that noise constitutes a serious hazard to health.

C. Workforce Projections

Without the passage of Federal noise legislation, the chances for enactment of State legislation are rather narrow. However, a small possibility for passage does exist, in which case the noise control staff in the Department of Health and Environmental Control would be significantly increased. Approximately $100,000 would be requested to initially set up a nominal staff of six professional and two clerical employees. The professionals, as it is now anticipated, would include two engineers, two industrial hygienists, and two biology-science majors, the latter group to perform inspections. All would preferably have had experience in noise control. Within the following year or two, after the program had been satisfactorily organized, and regulations defined, fourteen additional persons would be added, one to each district in the State. These coordinators would work with County Health Departments, whose sanitarians would be trained in aspects of noise regulation. These people would provide environmental enforcement, while law enforcement officers would become the main enforcers of vehicular noise. Eventually, the headquarters professional staff could conceivably be increased to twelve, at which point a leveling off would occur, as projected by State professionals.

Passage of State noise legislation would cause a great deal of impact at the local level. State regulations would be retrofitted over local ordinances, and every county would probably require a noise control officer (there are 46 counties in the State). It is believed that in terms of available training, persons with master's degrees would be required. However, persons with bachelor's degrees would be adequate if properly trained.

Those persons that are qualified to deal with in-plant industrial noise in most cases would be qualified to deal with environmental noise control, as principles and instrumentation are similar. However, a shortage of qualified personnel exists at the present time, and even greater workforce needs would occur were environmental noise legislation passed.

D. Training and Certification

On-the job training would be required for all new entrants, it is anticipated, because of the shortage of institutional course-work available in noise pollution control. Mechanical and acoustical engineers would require this type of training and persons with bachelor's degrees would require even more. Upgrade training would definitely be utilized, of which at the present time there is no shortage, although locations are inconveniently scattered about the country. The U.S. Environmental Protection Agency offers such courses, as does the U.S. Department of Transportation and several manufacturing firms.

The Department of Health and Environmental Control has not offered noise-related training to out-of-agency personnel, although plans to do so were made in 1973 when passage of legislation was anticipated. The planned training was to teach monitoring techniques for municipal personnel and law enforcement officers, and to give background information concerning noise control to lawyers and judges. This training remains a goal to be performed if legislation is passed.

E. Career Potential

State professionals believe that the field of noise control will demonstrate significant growth within five years. Such a lack of persons with noise backgrounds exists that almost anyone with any training or experience in the field will be readily able to find employment.

Professionals in the field indicate that mastered engineers will be in greatest demand, especially those with expertise in the field. Were associate and bachelor level courses available, needs would increase for this level of personnel in the State, local and private sectors for monitoring activities.

F. Conclusion

Legislative authority for environmental noise control in South Carolina is lacking, and one person is committed to this area part-time at the State level. While approximately 50% of the State's municipalities have noise ordinances, few have definitive standards, and those that do are finding enforcement difficult, in part due to the lack of training available for personnel. In the private sector, in-plant noise is regulated, but few persons with any real expertise are available for noise control.

Efforts continue at the State level to promote passage of noise legislation, and those involved are fairly optimistic that passage will take place in the next several years. When this does happen, great increases in personnel will take place at the State level, the local level, and to some extent at the industrial level, where significant needs already exist for noise control experts.

Unless courses in educational institutions are developed and implemented at the two-year, four-year and graduate level in the near future, the State will meet with great difficulty in the implementation of a viable program if noise legislation is passed. Fortunately, training opportunities are available from the federal government and manufacturing firms that will be able to assist in upgrading the expertise of personnel.

III. PESTICIDES

A. Introduction

The Division of Regulatory and Public Service Programs of Clemson University is designated through the South Carolina Pesticide Control Act of 1975 as the state agency responsible for the administration of the provisions of the Act. The Division's overall mission is to regulate the registration, quality, sale, distribution, and use of pesticides, and in support of this mission is the certifying unit for all applicators, and is responsible for all pesticide registration activities. The Division is committed to the belief that its efforts and activities will be of benefit to the agricultural and business communities, provided that EPA meets its legislative mandates by its deadline, October 21, 1977.

Cooperation is received from the South Carolina Department of Health and Environmental Control regarding several aspects of pesticide control. The Solid Waste Management Division is responsible for developing regulations relating to the storage and disposal of pesticides and pesticide containers, and will effect program implementation. In addition, pesticides related responsibilities take place within the Office of Environmental Health Systems Research, which is a coordinating body, involved in such programs as PCB and DDT investigations, lead screening, and poison control information and referral. Professionals in this office consult with other State agencies, hospital medical staffs, and local officials concerning all aspects of pesticide control, and conduct research concerning the determination of the effects of pesticides on humans. In addition, a center located in the Office for Disaster Preparedness and Emergency Response focuses activities mainly in the area of transportation. In cooperation with the U.S. Department of Transportation, shipments are controlled, and trucks are investigated for proper handling of hazardous materials. Pesticides, however, do not constitute a major portion of the disasters, which are mainly oils, fuels, and radiological materials.

Also working in cooperation with the Division of Regulatory and Public Service Programs are the Cooperative Extension Service and the South Carolina Aeronautics Commission. The former agency is responsible for the training of commercial pesticide applicators within the State, and for training county extension leaders who, in turn train private applicators. The Aeronautics Commission examines aerial pesticide applicators in accordance with the requirements of the Division of Regulatory and Public Service Programs.

A Pesticide Advisory Committee was established by the South Carolina Pesticide Control Act, and is made up of fifteen members from the public and private sector. This Committee provides advice to the Director of the Division of Regulatory and Public Service Programs on problems relating to the use and application of pesticides, including pest control problems, environmental or health related problems related to pesticide use, and review of needed legislation, regulations, and agency problems.

B. Workforce Profile

The Division of Regulatory and Public Service Programs employs seven professionals in-house for pesticide activities. Included are three Ph.D. entomologists, one M.S. chemist, one M.S. Environmental Health Specialist and a B.S. entomologist on loan from EPA. Four of these six work full-time in pesticides activities. Four professionals with agricultural backgrounds conduct enforcement duties that are related to pesticides and are located in various areas of the State. Eight additional inspectors located in the field perform enforcement activities, and spend approximately 25% of their time in pesticides. Clerical support is provided by two full-time and one part-time secretary. Also within this Division are the equivalent of 2.5 analytical chemists who perform laboratory procedures on pesticides products for quality control.

In the Office of Environmental Health Systems Research of the Department of Health and Environmental Control there are three professionals who spend approximately 30% of their time in pesticide-related work. There are also six inspectors in the office whose work relates to pesticides, and staff support can be called upon from the Division of Epidemiology when needed. Through a Memorandum of Understanding with the U.S. Department of Transportation, thirty-six inspectors also are utilized for enforcing hazardous material regulations.

Training activities by the Cooperative Extension Service are overseen by one full-time and two part-time professionals. In addition, at least twelve extension specialists spend approximately 25% of their time in pesticides-related activities. These people train the commercial applicators and the 140 county agents that spend approximately 20% of their time devoted to training private applicators.

As of November 2, 1976, approximately 2,158 commercial applicators were certified out of an estimated 3,850 that will need to be certified by the deadline date, October 21, 1977. By the same token, on November 1, 5,754 private applicators had been certified out of an estimated total of 35-40,000 requiring certification. The number of pesticide dealers requiring licensing is estimated to be from 1,000 to 2,000.

C. Workforce Projections

Within the regulatory aspect of the field of pesticides, the only staffing increase that is felt to be required by professionals in the field is in the area of investigation. Activities concerning the use, registration, quality, sale, and distribution will remain at approximately the same levels that they are currently at. However, to meet the increasing investigation and enforcement needs, it is projected that the number of full-time investigators will increase from four to ten in the next five years. These increases will probably be spread throughout this time period. Persons with bachelor's or master's degrees will be sought, with some background in pesticides. Turnover has been very low, with only two professionals having left in the past ten years. It is anticipated that the low pay rate might increase as the number of enforcement personnel increases. Because professionals in the Division of Regulatory and Public Service Programs believe that few people with the qualifications and characteristics they seek are available, some people may be hired that will not perform adequately. The chief characteristics sought are diplomacy and the ability to handle delicate situations.

No increases in staffing levels in relation to pesticides are forecasted by professionals in the Department of Health and Environmental Control or the Aeronautics Commission. Increases are not expected to take place in relation to staffing levels or activities in the Extension Service, pertaining to pesticides. The amount of time spent by the specialists in pesticides work will decrease to 2%-5%, however, after the majority of the training has been completed, in 1977.

As previously stated, the total number of private and commercial applicators requiring certification will, by law, be certified by October 21, 1977. Beyond this time, in most commercial categories, increases should take place at a low rate; State officials estimate a maximum of five percent per year. The only exception to this estimate pertains to category number seven, "Industrial, Institutional, Structural and Health Related Pest Control", in which a higher annual growth rate of applicators is projected, due to mandates of the law. Private non-certified and non-trained citizens will no longer be able to apply many pesticides themselves. Also accounting for the projected increases is the hope and anticipation of State regulatory personnel that an increasing number of non-certified applicators will be required by their companies to become certified as the managements realize the full amount of responsibility they carry. At the present time, under category seven, the ratio of non-certified applicators is three to one. It is hoped that this ratio will decrease to one to one, as it is believed to be in other categories.

The turnover rates for commercial applicators is difficult for State personnel to estimate, and is not readily available from private concerns. However, professionals in the public sector have expressed the belief that turnover would be quite high only in category number seven.

The following table depicts current and future numbers of commercial certified applicators, as estimated by State professional personnel.

TABLE III

SOUTH CAROLINA CERTIFIED PESTICIDES PERSONNEL

Workforce Projections to 1982 (est.)

Category	1976	1977	1978	1979	1980	1981
1. Agricultural - Plant & Animal	115	505	530	557	585	614
2. Forest Pest Control	67	100	105	110	116	122
3. Ornamental & Turf	433	1,000	1,050	1,103	1,158	1,216
4. Seed Treatment	49	75	78	82	86	90
5. Aquatic Pest Control	83	250	262	275	289	303
6. Right-of-Way	84	125	131	138	145	152
7. Industrial, Institutional and Structural	515	800	880	968	1,065	1,171
8. Public Health Pest Control	148	200	210	220	231	243
9. Regulatory	22	45	47	49	51	54
10. Demonstration & Research	522	600	630	661	694	729
11. Aerial	120	150	163	171	179	187
TOTAL	2,158	3,850	4,086	4,334	4,599	4,881

It must be re-emphasized that the above projections were stated by the sources to be maximums. In reality, actual numbers may be lower. In addition, the sum of the operators certified in each category may not represent the total numbers of persons certified, as an unknown number of people hold certificates in two or more categories. Further, the number of persons requiring certification is contingent upon the number and types of pesticides on the final restricted use list, to be released by EPA.

D. Training and Certification

The main source of upgrade training for those in the public sector is Clemson University. Employees may take advantage of a variety of short courses offered, and have the option of attending graduate school. In addition, the majority of those in the public sector working in the area of pesticides have received training from the Extension Service, and have become certified applicators.

Applicator training is fairly uniform, and the Colorado Slide-Tape presentation is utilized. Commercial sessions, covering the General and Specific standards, are presented by Extension Specialists of the Cooperative Extension Service, with ten to eighteen present at each session. This procedure is utilized so that the sessions provide more variety, facilitating greater attention and retention on the part of participants. The General Standards are based on the EPA Core Manual, while the Specific Category Standards cover material prepared in manual form by the Cooperative Extension Specialists and members of the Division of Regulatory and Public Service Programs. Personnel from this latter unit also assist in training by covering topics such as "Laws and Regulations" and "Pesticide Labeling." The procedure of utilizing a group of Specialists for each session, where no one person speaks for over an hour is felt by State personnel to be unique and effective, and feedback from participants has been very positive.

These commercial sessions are held in various larger cities throughout the State. Most categories will have training sessions two times per year, while training for certain categories with large numbers of applicators are held up to five times annually. Training for General Standards requires approximately one and one-half days, while Specific Category Standards require approximately one-half day. At the completion of this training, a pesticide field agent from the Division of Regulatory and Public Service Programs administers the written examinations for the General and Category Standards. Examinations are forwarded to the Division of Regulatory and Public Service Programs, where they are reviewed and processed for computer grading, data storage and printout and mailing of certificates. According to professionals, 75%-80% of all applicators pass the test the first time. Exam-only sessions are held approximately every three months in several locations in the State.

Approximately 140 county extension leaders (at least one from each of the 46 counties) have been trained by the Extension Specialists and were examined and certified by the Division of Regulatory and Public Service Programs in the Plant Agricultural and the Demonstration and Research Categories. These certified agents, in turn, present the training to farmers for private applicator certification based on the EPA Core Manual for private applicators. These meetings are held at a prespecified date and place, often the county agent's offices, and one to four sessions in each county are held each year, depending upon the needs. Sessions are held seasonally, usually during the fall or winter, when farmers are not inundated with farm work. After an initial negative reaction of the farmers to these new requirements, responses to the training and certification procedures have been favorable. Private applicators are not required to pass an examination to become certified.

Training demands for both commercial and private applicators will necessarily decrease after the deadline date of October 21, 1977. However, all types of training will still be offered, but to a more limited extent. Because the quality of training currently being offered is very high, according to State personnel, no plans for revisions are being made at this time.

Several private firms in the State have developed courses for training applicators which are intended to lead to certification. State personnel believe these people do an adequate job, and numbers involved may increase.

E. Career Potential

Within the public sector, workforce levels are not expected to increase, except in the area of investigation. This will require persons with general agricultural backgrounds, with specific knowledge of pesticides.

In the private sector, the growth rate for certified applicators is expected to increase at a minimum rate of 5% per year, with the exception of Industrial, Institutional, Structural and Health Related applicators, who are projected to increase at a higher rate, approximately 10% annually.

State professionals believe that current needs exist, which will be increasing, for graduate level persons with broad backgrounds of expertise in the field of pesticides. Though few of this type of person exist, the needs exist in the areas of training and regulation in the public sector, and for consultation and training in the private sector. More industries and consulting firms are developing and offering training courses for applicators to lead to certification. One of the most glaring needs is for persons with expertise in aquatic pest control. In addition, while the field of integrated pest management is not a panacea, as some believe, according to State officials, interest is expanding, and professionals with a broad range of expertise will be in more demand in this field.

Although the implications of the recently-passed Federal Toxic Substances Control Act at the State level are not totally known, it appears to State professionals, based upon available information, that the impact will be slight at the State level. Industries, however, will be finding the needs for professionals with advanced training in the area of toxic substances to gather chemical and biological data, to determine the persistence of substances, and to provide the required breakdowns of these substances.

F. Conclusion

For carrying out current duties and requirements at the State level, those agencies that are involved in South Carolina in pesticides appear to be adequately staffed. Training demands will decrease in late 1977, and only the area of investigation is projected to require an increase in personnel. The passage of the Federal Toxic Substances Control Act is not believed to require additional State staff.

Increases, also, in the workforce of applicators are not expected to be dramatic, but increasing at a maximum of 5% annually, excluding Category Number 7. This group of applicators, the Industrial, Institutional, Structural and Health Related applicators, is expected to show a growth rate of approximately 10% per year.

Although the training activities will lessen due to decreased demands, the nature of the training will not be changed, due to high efficiency and positive feedback from participants.

The firm belief is held by State pesticide officials that they have organized an efficient and successful pesticide regulatory program for the State. However, they further believe that the future of this program now rests upon the shoulders of the U.S. Environmental Protection Agency, to carry through with its obligations by the promised date.

IV. POTABLE WATER

A. Introduction

Responsibility for South Carolina's potable water program is charged to the Board of Health and Environmental Control by the State Safe Drinking Water Act of 1976. Actual implementation is carried out by the Water Supply Division of the Department of Health and Environmental Control.

The Act was adopted in 1976 to amend Article 1, Chapter 8 of Title 32, Code of Laws of South Carolina, 1962, as amended, so as to bring the State's laws into conformity with the Federal Safe Drinking Water Act, for regulation of public water supplies, as well as providing penalties for violations. According to a staff official of the State's Attorney General's Office, this law provides sufficient authority to the State for the regulation of public water supplies, and several enforcement actions are currently pending.

Act 1047 of 1966, amended by Act 175 of 1969, and further amended in 1972, created the South Carolina Board of Certification of Environmental Systems Operators. Under this mandatory certification law, the plant classification/type, as defined by the Act, establishes the grade of certification required by the operator in charge of water treatment plants. Other technical operations personnel in the plant should be certified at equal or lower levels. The State Certification Board has responsibility for establishing rules, regulations, and standards and for administering the certification process, including developing and conducting formal examinations.

Although the Water Supply Division has increased its staffing level and has begun implementation of programs required under the new legislation, additional increases in personnel are expected to be needed to achieve full implementation.

B. Workforce Profile

Under a proposed organizational plan for the Water Supply Division, four sections will be formed with the following goals:

> Facilities Section: to conduct a statewide program to obtain properly designed and constructed water supply, collection, treatment, storage and distribution facilities.
>
> Surveillance and Technical Assistance Section: to conduct a statewide program of inspection which can determine that all public water supply systems are being operated and maintained in a manner which is consistent with good engineering practices and ensure that the public receives a safe, potable supply of drinking water.
>
> Enforcement, Variance and Exemptions Section: to conduct a statewide program to review the status of existing and proposed water supply systems to determine compliance with state and federal laws.
>
> Hydrology and Quality Control Section: to develop and implement a statewide ground water quality program.

In addition, the formation of a program development unit is anticipated, the goal of which shall be to develop a statewide program to provide every citizen of South Carolina with safe drinking water. Duties will include the development of laws, rules and regulations, coordination with local governments and water utilities, preparation of public information and water supply data for dissemination, the development of a data processing procedure, and the coordination of grant activities.

Laboratory support is supplied to the Water Supply Division for the analysis of collected water samples by the Analytical Services Division of the Bureau of Field and Analytical Services. The Analytical Services

Division maintains six regional laboratories and a sophisticated central lab. Monitoring and inspection of water supply facilities are carried out also in this Bureau, through the Division of District Services. This Division maintains twelve district offices (see the Air section for specific locations).

During 1976, seven additional persons commenced employment in the Department for water supply activities: six engineers and one biologist. By the latter part of the year, professional staffing levels appeared as follows:

TABLE IV
SOUTH CAROLINA DEPARTMENT OF HEALTH AND ENVIRONMENTAL CONTROL
Current (1976) Potable Water Staffing Level

Position	1976
Engineer	18
Scientist	8
Technician	14
TOTAL	40

Engineers include both persons with master's and bachelor degrees. The latter group requires more in-house training, as few sanitary engineering educational programs are offered at the undergraduate level. Mastered engineers come from sanitary or environmental engineering programs. "Scientists" include biologists and chemists, and work in laboratory operations. Ten of the technicians in water supply activities collect water samples, and have high school educations with previous experience in the field.

There are a total of 2,970 public water sources identified in the State of South Carolina, broken down as follows:

Number	Type of Source
100	Surface water treatment plants with sizeable staffs
400	Water sources with treatment requiring the presence of a full- or part-time operator
2,470	Wells requiring no treatment under current conditions

Operators are certified according to the type of plant they are responsible for, the details for which are defined in the Act. The State utilizes seven major categories for the certification of operators, grades A through D, with Grade A operators in charge of the most complex plants, Grade D-groundwater, Trainee permit, and No Grade. Groundwater certificates are required for those that are the operators-in-charge of groundwater plants. Trainee permits are valid only for two years, and those holding this permit must be under the supervision of a legally certified operator. This classification was included in order to facilitate the recruitment of new personnel. "No Grade" licenses were issued to those that worked in water treatment plants at the time that the mandatory certification law went into effect. These people were not required to pass an examination in order to become certified and to continue working at the same plant, but they cannot relocate to other plants without passing an appropriate examination and becoming fully certified.

State district personnel with duties of inspecting water treatment plants may be issued certificates qualified by the word "inspector" to indicate that they have fulfilled all requirements for certification with the exception of employment in a plant and at least one year's full-time experience as an operator in a public water treatment plant. As of November, 1976, three persons were certified under this classification.

Laboratories are certified by the Department of Health and Environmental Control, while laboratory technicians are certified by the State Board of Certification. Three laboratory technicians had been certified under this category for water supply analytical work as of November, 1976.

The following table depicts the numbers of operators of water treatment plants certified in South Carolina as of November, 1976, as supplied by the Department of Health and Environmental Control.

TABLE V
SOUTH CAROLINA CERTIFIED WATER TREATMENT PLANT OPERATORS
Current (1976) Staffing Level

Classification	1976
A	64
B	102
C	219
D	211
D-groundwater	75
Trainee	333
No Grade	175
TOTAL	1,179

It can be readily seen from the table that the category with the largest number of personnel is the "trainee" group, which is nearly twice as large as the "No Grade" group. This suggests that a workforce expansion is occurring and/or many persons are leaving the profession and being replaced by newly-trained personnel. According to State administrators, both of these situations are occurring. The table also shows a greater number of persons certified in lower grades, with gradual decreases upward.

This reflects the greater number of underground sources and those requiring less sophisticated treatment.

C. Workforce Projections

As a result of the passage of the Federal Safe Drinking Water Act and the subsequent State legislation, increased workforce needs are projected for functions relating to potable water in the South Carolina Department of Health and Environmental Control. The Director of the Division of Water Supply developed a five-year plan which provides proposed increases over the pre-grant, early 1976, staffing levels. This plan calls for an increase of 25 persons over the pre-grant number, or 18 over current 1976 levels.

In administration and program development, the addition of seven persons over the present level of four is requested for developing laws, rules and regulations, and for coordination with local governments. The Division anticipates the establishment of many county-wide water systems, with corresponding planning activities. These people would also provide coordination of grant activities, preparation of the annual report, and the development of data processing procedures. Nine additional persons above the current level of 23 are requested for surveillance and enforcement, who will perform the following functions:

1) Develop a statewide surveillance program, reviewing monitoring reports submitted by water suppliers, and ensuring, where necessary, that public notice has been given;

2) Develop rules and regulations for implementation of Primary Drinking Water Standards;

3) Develop a procedure for processing requests for variances and/or exemptions including holding public hearings and preparing transcripts,

4) Review variance and/or exemption requests and develop compliance schedules where appropriate (officials anticipate 500 requests by 1980).

5) Follow-up on compliance schedule activity,

6) Initiate and direct necessary legal action to ensure compliance.

One additional person over the current level of four is requested for Plan Review for handling the expected increase in water supply construction. Some of this construction will be for new systems, while others will be necessary construction to tie together existing systems, and still others will be to add various new treatment process equipment to systems not meeting Primary Standards.

Two persons currently work in the Bureau of Field and Analytical Services in the area of laboratory certification for water treatment plants. These persons evaluate laboratories in the public and private sectors that perform analyses of drinking water, and no increased needs are foreseen. Since the level of state monitoring is not expected to increase significantly under the Federal Safe Drinking Water Act, the addition of one person for laboratory capability is felt to be sufficient.

Not listed in the five-year plan is the Hydrology Section, which will also require growth for the EPA underground injection control program, which should begin implementation in 1978. The addition of two geologists and two technicians is expected by that time, and continued growth may subsequently occur.

Specific occupational projections for those working in the area of potable water, in both the Bureau of Field and Analytical Services and the Water Supply Division, as supplied by the Division director, appear in the following table:

TABLE VI

SOUTH CAROLINA DEPARTMENT OF HEALTH AND ENVIRONMENTAL CONTROL

Potable Water

Workforce Projections to 1982 (est.)

Position	1976	1977	1978	1979	1980	1981	%/annum turnover (average)	%/annum growth (average)
Engineer	18	26	26	26	26	26	6%	9%
Scientist	8	11	15	16	16	16	7%	16%
Technician	14	14	19	19	19	19	9%	7%
TOTAL	40	51	60	61	61	61	7%	9%

The majority, if not all, of the environmental and sanitary engineers required are expected to be added to the staff by the end of 1977. The increases depicted for "scientists" represent the additions of "environmental quality managers" (EQM's), biologists and chemists for the laboratory portion, and geologists. The EQM series is broad, in which persons come from a variety of backgrounds, usually in the natural sciences. Technicians will have associate degrees, and will chiefly perform sample-taking functions.

Turnover rates are lower than they had been previous to 1975. The decreases are attributed primarily to: a) the upward adjustment of pay scales starting in 1973, b) the offering of post graduate educational opportunities on an expanded basis, and c) the economic recession.

Administrators within the Department of Health and Environmental Control estimate a minimum annual requirement of 50-100 new operators and 200-300 operators for upgrade technical training over the next five years to meet the requirements of the current law. Exactly what types of shifts will take place between classifications is difficult to determine at this time, although it is projected that the greatest proportion will remain at the lower levels, though an upward trend will occur, due to the construction of new complex facilities and the upgrading of existing facilities.

The numbers of certificates issued to laboratory technicians will necessarily grow due to more stringent requirements of the law. Within five years, it is projected that approximately 100 certified technicians will be required. In some cases, these will be the operators of the plants. The number of State facility inspectors is not expected to grow as dramatically, however, projected at a maximum of 25% growth over the next five years.

The following table depicts present and future levels of certified operators, inspectors and lab technicians, according to the best professional estimates of administrators within the Department.

TABLE VII

SOUTH CAROLINA CERTIFIED WATER TREATMENT PLANT PERSONNEL
Workforce Projections to 1982 (est.)

Position	1976	1977	1978	1979	1980	1981	%/annum growth (average)
Operator[1]	1,179	1,229	1,279	1,329	1,379	1,429	4%
Operator[2]	1,179	1,279	1,279	1,479	1,579	1,679	7%
Lab Technician	3	20	40	60	80	100	155%
Inspector	3	3	4	4	4	4	7%
TOTAL	n/a	n/a	n/a	n/a	n/a	n/a	n/a

[1] Minimum Projections

[2] Maximum Projections

D. Training and Certification

All new entrants into the Office of Environmental Quality Control receive a structured orientation and direct supervision from senior departmental employees (see the Appendix). Upgrade opportunities, too, are offered to potable water employees. Technical courses from EPA in the area of potable water are not available, and few related university short courses can be found. Managerial and administrative courses have been substituted when necessary, and employees have attended the Environmental Management Institute at the University of Southern California. EPA fellowships are expected to become available for graduate education in the field of potable water.

The lack of technical training available to State potable water personnel is seen by officials as a deterrent to full program implementation. A similar situation exists in the area of training for water supply facility staff and technicians. Limited training and educational opportunities for this level of personnel are available in the State. The Department feels it is currently faced with increasing emphasis on potable water without equivalent resource increases to meet the demands.

The following types of operator and technician level training programs in potable water are currently available:

1) A two-year environmental technology program leading to an associate degree is available at Greenville Technical College, with a normal class load of 15-20 students. This has been funded at decreasing annual levels by EPA through Fiscal Year 1977. Fiscal Year 1976 output was 17 graduates (potable water and wastewater).

2) 80-hour Technical Education Systems Upgrade Programs are offered periodically at several technical schools, aimed for preparing operators for state certification. Training is also included for lab and other technicians, and is utilized chiefly by those already employed in technical positions. An EPA grant supported this program for the "C" and"D" levels through 1975. During Fiscal Year 1976 this was periodically offered as a normal program offering to be paid for by each individual student. There was a reduction at this time in output compared with that which was produced under the EPA grant: approximately 100 during Fiscal Year 1976 versus 539 in Fiscal Year 1975 for potable water and wastewater.

3) Clemson University offers correspondence courses that cover certification levels A-D in both potable water and wastewater. The courses offer basic training in such areas as operations, maintenance, and laboratory procedures. The estimated output for both potable water and wastewater in Fiscal Year 1976 is 272.

4) Clemson University's water and wastewater treatment plant operations training program sponsors short schools periodically during the year. The schools provide a three-day basic operations review designed to prepare water and wastewater treatment plant operators for state certificaiton examinations. Exams are given at the end of the short school. The water and wastewater output for Fiscal Year 1976 was 274.

All of these opportunities are expected to be offered through Fiscal Year 1977, with similar or slightly lower outputs. While these programs are felt by Department officials to provide marginally adequate training to operators, the chief problem lies in the number of students that can be accommodated. Through the available training modes, it is not anticipated that the projected annual new entry training requirements for 50-100 operators and for the upgrade training for 200-300 operators can be met.

E. Career Potential

Within the Department of Health and Environmental Control, for water supply program operations, annual increases in personnel are expected during the next several years. Openings are expected to occur for bachelor and master's level engineers, with preference shown for those with backgrounds in sanitary and environmental engineering. Geologists, chemists and biologists will be increasingly utilized, as will environmental technicians. Although technicians with associate degrees in the field are to be preferred, these persons are not readily available, due partially to the higher salaries offered in the private sector.

In the realm of water plant operations, it is expected that increasing needs will occur for entry level operators, and for greater numbers of operators upgraded to higher levels. Laboratory technicians also are projected to be in great demand.

F. Conclusion

Implementation of South Carolina's Safe Drinking Water Act is carried out by the Environmental Quality Control portion of the Department of Health and Environmental Control. Since the adoption of the Federal and State laws, the Water Supply Division of the Department has been preparing to achieve full program implementation. Growth in staffing levels occurred during 1976, and is expected to continue through 1979 with an anticipated growth of approximately 50% over this entire period. Growth, however, will be partially contingent upon the availability of State Funds, as Federal funds will not be able to provide for all of the projected needs. At this time, the Governor of the State is trying to effect a cutback on State employment.

Because of an increased emphasis in enforcement, and because of the construction and expansion of facilities, it is projected that increased numbers of plant operators and laboratory technicians will occur. The quantity of training for these people currently is not adequate, and additional State funds are not currently available to provide for a training expansion.

A lack of technical training available for Department potable water staff also exists, since EPA has discontinued its courses offered in the area. Because of the increased emphasis required in water supply regulation, and the technical nature of the field, it is feared that employee potential will not be fully realized, and that the State's program will not demonstrate the degree of success that would be possible were this type of training available.

V. RADIATION

A. Introduction

The South Carolina Department of Health and Environmental Control was designated in 1967 by the State Act 302/67, the Atomic Energy and Radiation Control Act, as the agency responsible for radiation protection within the State. This legislation allowed the Department to enter into agreement with the old Atomic Energy Commission (now the Nuclear Regulatory Commission) to conduct radioactive materials licensing and a regulatory program exercising jurisdiction in areas not regulated by the Nuclear Regulatory Commission.

In July 1968, the Division of Radiological Health was established within the Department of Health and Environmental Control. The program was expanded in 1976, and was elevated to Bureau status, and all radioactive responsibilities are currently carried out within the Bureau of Radiological Health. The Bureau maintains a complex Radiological Laboratory, which represents an investment of $200,000 in sophisticated instrumentation for the measurement and analysis of environmental samples.

The principle objective of the radiological program is to minimize exposure to the population, both directly from radioactive sources and indirectly through environmental pathways. As no threshold has been established for permissible radioactive exposure, any unnecessary exposure to radiation is to be prevented within the limitations imposed by the "as low as practicable" concept. Specific activities and functions of the Bureau can be divided into three categories: environmental monitoring programs, regulatory programs, and other activities. Environmental programs are oriented toward the evaluation of hazards associated with the use/operation of nuclear facilities. Regulatory programs are designated to ensure compliance by licensees and registrants with health and safety regulations. Finally, other activities represent those programs or activities designed to promote radiological health and safety throughout the State in general.

South Carolina is heavily impacted with nuclear facilities, which are monitored by the Bureau during pre-operational and post-operational phases. The following represents the major nuclear facilities in South Carolina that are monitored by the Bureau:

1) The Savannah River Plant of the Energy Research and Development Administration: three production reactors, a fuel and target fabrication plant, two chemical and separation plants, a heavy water production plant, waste storage tanks, and a waste burial ground;

2) H.B. Robinson Nuclear Station of Carolina Power and Light Company: one pressurized water reactor;

3) Westinghouse Nuclear Fuel Division of the Westinghouse Electric Corporation: a plant for manufacturing fuel assemblies for commercial nuclear reactors;

4) Oconee Nuclear Station of Duke Power Company: a three-unit pressurized water reactor;

5) Low Level Radioactive Waste Burial Facility of Chem-Nuclear Systems, Inc.: for shallow land burial of low-level radioactive wastes;

6) Barnwell Nuclear Fuel Plant of Allied-General Nuclear Services, Inc.: under construction, to recover uranium, plutonium and other products from irradiated light water power fuel;

7) Cherokee Nuclear Power Station of Duke Power Company: three pressurized water reactors under construction;

8) Virgil C. Summer Nuclear Station of South Carolina Electric and Gas Company and South Carolina Public Service Authority: one pressurized water reactor is under construction;

9) CVNPA Facility of the Carolinas Virginia Nuclear Power Associates: a small pressurized water reactor which was decommissioned in 1967;

10) Catawba Nuclear Station of Duke Power Company: two pressurized water reactors under construction;

11) Nuclear Submarine Facilities of the United States Navy: for nuclear submarine overhaul and submarine and tender berthing, in two locations.

B. Workforce Profile

The Bureau of Radiological Health is divided into three Divisions: the Division of Radiological Environmental Monitoring, the Division of Electronic Products, and the Division of Radioisotope Licensing and Compliance. To carry out all of the duties and responsibilities, two nuclear engineers are employed, as well as fifteen health physicists and three secretaries. Because health physicists and nuclear engineers are very difficult to recruit, math or physics majors and electrical and mechanical engineers are hired when necessary, and trained in the radiological field. Although monitoring is conducted throughout the State, all personnel are housed within the central office in Columbia and travel to monitoring sites as required.

Besides environmental monitoring in the vicinity of nuclear facilities, the Bureau participates in the U.S. Environmental Protection Agency's "Environmental Radiation Ambient Monitoring Stations Program", for which the Bureau collects and analyzes air samples through stations in Columbia and Anderson. The Bureau also is involved in EPA's "Tritium Surveillance Network Program" for checking radioactivity in drinking water, establishing baseline data relative to the "normal" or "background" amounts of tritium present. Other environmental monitoring programs include the "Ground

Water Radiation Monitoring Program", with primary emphasis upon radium in potable water, the "Surface Water Monitoring Program", which emphasizes monitoring surface streams not influenced by nuclear industry discharge, and an interstate water supplies program, in which the Bureau of Radiological Health participates with other government agencies.

A regulatory program of the Bureau is the licensing and regulation of all radioactive materials in the State pursuant to the State's agreement with the Nuclear Regulatory Commission. Regulation of the transportation of radioactive materials within the State is also carried out. Other regulatory programs pertain to X-rays, particle accelerators, and non-ionizing radiation. Control of X-radiation is achieved through the registration and inspection of every X-ray machine and the facility housing the device. The Bureau participates in the "Nationwide Evaluation of X-Ray Trends" program in cooperation with the U.S. Food and Drug Administration, which allows for computerization of inspection data on medical and dental facilities. In cooperation with the Dental Branch of the Federal Bureau of Radiological Health, a survey of dental X-ray facilities is carried out with other state agencies to determine the amount of radiation emitted from such machines and other data related to dental radiology techniques. This program is entitled "Dental Evaluation Normalization Techniques" (DENT).

Particle accelerators are registered by the Bureau and inspected periodically for adherance to regulations. The Bureau also maintains inspection capabilities to determine most radiation hazards that exist from sources of non-ionizing radiation. Inspections are conducted only when a request for such occurs, since no established regulatory program governing these devices presently exists.

Other activities carried out by the Bureau of Radiological Health include reviewing Environmental Impact Statements, providing testimony and technical assistance for administrative hearings required for licensing of nuclear facilities, training staff members, and public information assistance. In addition, an Emergency Radiological Assistance Team is maintained by the Bureau to provide response capabilities and technical assistance in abating an emergency situation and recovering from such situations.

The major problem confronted by the Bureau of Radiological Health is that qualified personnel are very difficult to recruit, attributed to both an overall shortage of professionals in the field, and the low salaries offered by the State. The professionals on the staff must be as knowledgeable as those of private industry in order for the Bureau to achieve proper control, but salaries offered by industry are considerably higher.

In the private sector, one also finds personnel employed for radiation control. State and private sources indicate that on the average, each facility employs one staff professional, usually a certified health physicist with a master's degree and one health physics supervisor who may or may not be certified. In addition, each facility employs a minimum of six health physics technicians, although larger facilities employ as many as twenty-five. These persons are usually not degreed, and are trained by the facility staff, although some have associate degrees in the field. Plants usually hire their health physicists several years before the actual operation of the plants begin, and technician staffs are increased up to the point of actual operation. Based upon this data, it is estimated that approximately 20 health physicists (one-half or more of them certified) are currently employed by nuclear facilities in South Carolina, supported by approximately 100 health physics technicians. It must be pointed out that these persons spend the largest portion of their time for in-plant radiation safety, but also perform environmental monitoring.

State sources are aware of two major medical installations in the State that employs a professional to perform functions relating to radiation control from X-rays and radioisotopes. These persons are radiation physicists.

Also in South Carolina, one private laboratory performs radiological testing and analysis. State professionals who are familiar with this laboratory estimate that twelve radiochemists are employed. Utility companies often have their own radiologic capabilities, and it is estimated that the total private sector in South Carolina employs at least 20 radiochemists for this type of analytical work.

C. Workforce Projections

During 1976, additional money was available for adding two additional professionals to the Bureau of Radiological Health, but qualified persons had not yet been found. It was, however, projected that in 1977 one nuclear engineer and two health physicists would be added to the staff for keeping up with current requirements. Five-year projections provide for an increase of three additional health physicists for the licensing program, as an annual 15% increase in licenses issued to isotope users is occurring. Whether or not additional staff will be required in the next five years for nuclear control is dependent upon the outcome of a major issue that is to be resolved by the federal government. This issue relates to the refabrication and use of plutonium in nuclear reactors. If the Barnwell reprocessing plant that will recover uranium, plutonium and other products is allowed to operate, and the products are shipped and utilized in nuclear reactors, the Bureau of Radiological Health will require additional professionals to monitor and regulate activities. Administrators anticipate that five extra professionals would be sought, both nuclear engineers and health physicists.

As new units and facilities are being constructed and expanded, an increase in numbers of plant personnel is expected. Based upon the known numbers of additional units and facilities to be constructed and/or operated in the next five years, and based upon input from the public and the private sectors, it is estimated that five to ten additional health physicists will be required, as well as 60 to 80 additional technicians.

Several major medical facilities in the State are currently searching for radiation physicists for radiation control and in-house monitoring functions, although persons with this type of expertise are not readily available. State sources have estimated that within five years, approximately ten radiation physicists will be servicing medical facilities in the State. Increased requirements in the private sector for radiochemists to perform analytical work are expected to be minimal, based upon current and projected demands for these services.

The turnover rate within the Bureau of Radiological Health is approximately 5%. Those that leave usually do so to accept jobs with the federal government or private industry, where salaries are considerably higher.

Sources from the private sector indicate that turnover rates within the nuclear facilities are very low, due to the high salaries and promotional opportunities.

D. Training and Certification

Because persons with expertise within the radiation field are difficult to recruit, employee training is an essential component of the activities of the Bureau of Radiological Health. Moreover, familiarization with new technology and procedures is required to continue and improve the effectiveness of the Bureau's programs. While informal on-the-job training is offered to new personnel, new and on-line personnel are offered formal training opportunities. During Fiscal Year 1975, one employee each participated in the following activities:

1) The completion of formal class hour requirements for a master's degree in health physics;
2) Participation in the Nuclear Regulatory Commission's Region IV Inspector Training Program;
3) Completion of the ten-week health physics course taught at the Oak Ridge Associated Universities;
4) Completion of a two-week course in basic radiological health conducted by the Lowell Institute of Technology;
5) Attendance of a one-week course at Battle Creek, Michigan conducted by a consortium of federal agencies where state radiological health planning was taught.

Other staff members have received special training at national laboratories in conjunction with new projects begun in environmental sample analyses. In addition, the Bureau participates in the Regional Training Committee that was developed by the Region IV Environmental Protection Agency. EPA radiation personnel from Headquarters and Region IV participate in this

Committee, as do State Radiation Directors, which was formed to assist states in meeting their training needs. Symposiums are held two or three times a year where training voids are determined and plans of action are discussed and implemented. Outgrowths of these symposiums are courses offered to state regulatory personnel. Courses offered in 1976 include "Management of Radiation Incidents - Fixed Facilities", which was held in South Carolina, and "Basic Radiological Health - X-Ray and Environmental Radiation". In 1977, South Carolina will also sponsor a course on radium in drinking water.

To improve effectiveness in radiation health the Bureau assists in the training of non-Bureau personnel. During Fiscal Year 1975, Bureau personnel were involved in providing training to a total of 554 persons. Those trained included firefighters and law enforcement officers who were trained to handle emergencies involving radioactive materials, and medical and dental technicians in the area of radiological health and safety. This latter program has been in existence for two years, and is offered for those technicians who are not offered training by their employers. Classes are offered intermittently. An academic program is offered through the State's Educational System and a degree is provided to graduates. A problem is encountered in recruiting technicians from medical and dental offices, as employers often do not provide time-off, and once technicians are trained, they often demand higher salaries. This is the group most in need of training, however, as major hospitals, six of which are in the State, offer training to their own personnel in radiological health and safety.

Several technician-level associate degree programs in the nuclear field are offered in the State. Several sources in the field, however, suggest that students in these programs are not taught all the skills necessary to carry out assigned radiation control functions in the nuclear facilities. Instead of recruiting graduates of these programs for health physics staffs, many facilities hire persons that often have had no prior experience in the field, and provide in-house training to them. Although this system has proven adequate in training capable health physics technicians, sources indicate that they would readily utilize persons from associate degree-type programs were these programs providing the needed educations. These professionals mentioned that the Health Physics Society is beginning to direct efforts towards the development of a certification program for health physics technicians similar to the program currently certifying health physicists.

E. Career Potential

Within the State's radiation program, opportunities should be available for nuclear engineers and health physicists, the total amount depending upon the outcome of decisions to be reached at the federal level. Nuclear facilities will find increased requirements for health physicists, and to a larger degree, for health physics technicians. Currently, persons with no prior experience in the field are often hired and trained to become health physics technicians, although those with training deemed adequate by the facilities would readily be hired. Hospitals and other medical facilities will probably find increasing needs for radiation physicists, and the private and public sectors will continually utilize radiochemists, but overall growth in this field is not expected to be dramatic.

The field of non-ionizing radiation has a large potential for growth, according to State administrators, as the U.S. Food and Drug Administration is currently researching this area and may discover needs for stronger controls.

It is felt, however, that backgrounds needed in this area would still be in the areas of health physics and nuclear engineering, although additional coursework in non-ionizing radition would be required.

Several issues to be resolved at the federal level will have strong impacts on radiation control workforce levels in the public and private sectors, in the State and nationally. These issues relate to the use or non-use of plutonium in reactors, and how reactor wastes will be handled and maintained in the future. If wastes are to be stored on the earth's surface, significant workforce needs would occur for prevention of leakage to the environment. The plutonium issue (GESMO) is now in national rule-making process. If plutonium cannot be used, workforce levels would have to be continually increased for accounting for and guarding the plutonium, for reasons of national security.

F. Conclusion

The Bureau of Radiological Health anticipates a need for workforce growth, the magnitude of which is at least partially dependent upon major decisions to be reached by the federal government. New positions would be filled by nuclear engineers and health physicists. Growth in the private sector is also projected, particularly for health physicists and health physics technicians in the nuclear industry and for radiation physicists, and to some degree, radiochemists in medical facilities. Persons trained in these areas are currently not readily available, and professionals in the public and private sectors voice the feeling that a great need exists for expansions of institutional programs for training health physicists, radiation physicists, and to a lesser extent for radiochemists and nuclear engineers. Vocational training programs for technicians in the field do exist in the

State, but many facilities prefer to hire untrained persons and provide in-house training, because of the belief that these institutional programs are not meeting their needs. The State agency also finds a need to provide technical training to employees, which is met through several means, one of which is a Regional Training Committee established by Region IV EPA.

VI. SOLID WASTE

A. Introduction

Solid waste management control functions are assigned to the South Carolina Board of Health and Environmental Control and implemented by the State's Department of Health and Environmental Control. Authority is granted for the development of regulations and the enforcement of their provisions by Act 1157, the Pollution Control Act of South Carolina, 1970, as amended by Act 410, the General Appropriations Act of 1971 and Section 32-8 (11) of the 1962 Code, as amended. The Pollution Control Act governs the industrial solid waste disposal activities, while the permitting control process for sanitary landfills falls under the purview of the State Statute. These laws are written in broad terms, but it is believed by State officials that sufficient authority is granted to the State for carrying out current required responsibilities. With the passage of the Federal Resource Conservation and Recovery act, a new State law specifically designed to deal with solid waste management, hazardous materials and resource recovery may be required.

Although the full impact at the State level of this new law is currently impossible to accurately predict, it appears that not only will new legislation will be required, but that increasing needs will occur for additional personnel, and for upgrade training opportunities that are currently not available. In addition, although certification is not required for landfill operators or others within the field, nor is such a process available to those interested, to establish authority and develop such a program is a goal within the Department of Health and Environmental Control.

B. Workforce Profile

The responsibility for solid waste activities within the Department is assigned to the Solid Waste Management Division of the Bureau of Special Environmental Programs. This Division is concerned with domestic and industrial solid waste collection, storage, and disposal. Personnel assist in the design of facilities, issue permits, monitor facilities for compliance with regulations and provide training for landfill operators.

The following table indicates the numbers of personnel currently working within the Solid Waste Management Division:

TABLE VIII

SOUTH CAROLINA DEPARTMENT OF HEALTH AND ENVIRONMENTAL CONTROL
Solid Waste Management Division
Current (1976) Staffing Level

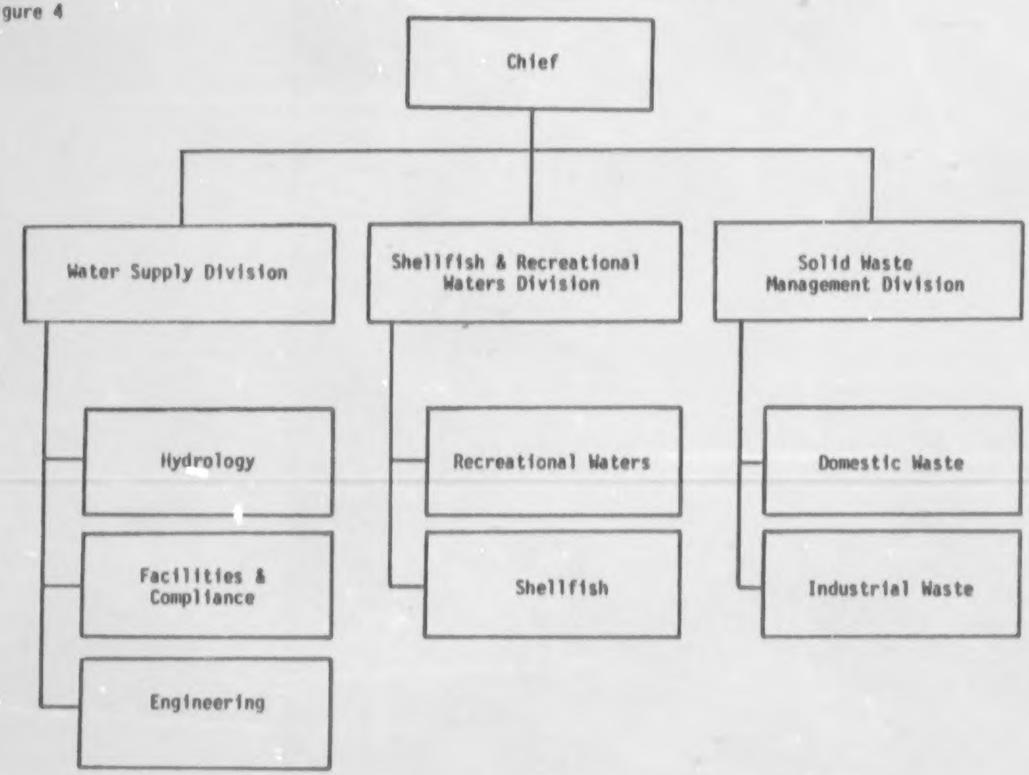
Position	1976
Engineer	6
Entomologist	1
Scientist	12
Technician	4
Trainer	3
Other	3
TOTAL	29

The scientists, or "environmental quality managers" come from a variety of science backgrounds, e.g., chemistry, or biology, and all have at least bachelor level degrees. Eleven of these serve as consultants in the Department's district offices, which are located in various locations throughout the State (see the Air section for specific locations).

The Analytical Services Division of the Bureau of Field and Analytical Services also provides laboratory support to the Bureau. However, analytical services are also provided in the areas of potable water and wastewater,

SOUTH CAROLINA DEPARTMENT OF HEALTH AND ENVIRONMENTAL CONTROL
OFFICE OF ENVIRONMENTAL QUALITY CONTROL
BUREAU OF SPECIAL ENVIRONMENTAL PROGRAMS*

Figure 4


Chief
Water Supply Division
Shellfish & Recreational Waters Division
Solid Waste Management Division
Hydrology
Facilities & Compliance
Engineering
Recreational Waters
Shellfish
Domestic Waste
Industrial Waste

* A separate Geology Unit may be formed

and workforce breakdowns by discipline are difficult to estimate. A rough estimate provided by State administrators is that 5% of laboratory time and effort is expended toward solid waste activities.

Within South Carolina, there are 74 domestic and 110 industrial landfills. At each domestic landfill is at least one operator, while the larger employ three to five. Industries generally employ one person part-time to provide adequate disposal. Three county-operated solid waste disposal sites are involved in scrap metal recovery: Beaufort, Charleston, and Georgetown Counties. Most resource recovery, however, takes place within the private sector. According to lists compiled by the Bureau, 24 public and private facilities recycle waste paper and cardboard, 19 private companies recycle scrap metals, and twelve companies salvage used oil. Additionally, two companies recycle glass, one salvages sawdust and woodchips, one recycles bones, fat and grease, and six reprocess solvents.

Most hazardous wastes in the State are disposed of by direct landfilling, and no specific hazardous waste sites have been developed. Specific techniques of landfilling these wastes, however are designed on a case-by-case basis. The Division informs hazardous waste generators of out-of-State firms that operate disposal facilities for hazardous wastes.

The following table lists the numbers of personnel currently employed in solid waste disposal operations, as supplied by the Solid Waste Management Division:

TABLE IX

SOUTH CAROLINA SOLID WASTE DISPOSAL PERSONNEL
Current (1976) Staffing Level

Position		1976
Landfill Owner/Operator		232
Weighmaster		4
Foreman		39
Spotter		17
	TOTAL	292

C. Workforce Projections

Turnover within the Department of Health and Environmental Control has been lower than it had been previous to 1975. Reasons attributed to this decline are: a) the upward adjustment of pay scales starting in 1973, b) the offering of post-graduate educational opportunities to employees on an expanded basis, and c) the economic recession. Within the last two years, turnover has been varying from 6% to 25%, depending upon the occupational level, and averaging approximately 10%.

Staff officials indicate that the current staffing level of the Solid Waste Management Division is a minimum for carrying out currently-required responsibilities. Growth, however, is expected to occur as a consequence of the new Federal legislation, the Resource Conservation and Recovery Act of 1976. State officials are unable to accurately predict the full impact of this bill to the Division, but believe that if the State impact of wastewater and potable water legislation is any indication, growth will be substantial, in both the public and the private sectors.

The following table depicts best professional estimates of administrators in the Department of Health and Environmental Control regarding future State workforce levels in solid waste:

TABLE X

SOUTH CAROLINA DEPARTMENT OF HEALTH AND ENVIRONMENTAL CONTROL

Solid Waste Management Division
Workforce Projections to 1982

Position	1976	1977	1978	1979	1980	1981	%/annum turnover (Average)	%/annum growth (Average)
Engineer	6	8	10	10	10	10	6%	12%
Entomologist	1	1	1	1	1	1	8%	0%
Scientist	12	14	16	18	18	18	6%	9%
Technician	4	4	4	4	4	4	9%	0%
Trainer	3	3	3	3	3	3	6%	0%
Other	3	3	3	3	3	3	25%	0%
TOTAL	29	33	37	39	39	39		6%

The number of sanitary landfills is slowly increasing, and the Division has been issuing an average of one permit per month for domestic landfills, and five per month for new industrial landfills. Turnover among landfill operators is estimated at approximately 5-10% annually by State personnel. Relying upon these figures, professionals with the Division project expect the number of landfill operators to increase by ten each year within the next five to ten years. Numbers of personnel in supporting positions are expected to increase at a similar rate because of the development of new facilities and the expansion of existing ones.

The following depicts five-year workforce projections for personnel in the field of solid waste disposal, according to the best professional estimates of professionals within the field:

TABLE XI

SOUTH CAROLINA SOLID WASTE DISPOSAL PERSONNEL

Position	Workforce Projections to 1982 (est.) 1976	1977	1978	1979	1980	1981	%/annum turnover (Average)	%/annum growth (Average)
Operator	232	242	252	262	272	282	10%	4%
Weighmaster	4	4	5	5	5	5	10%	4%
Foreman	39	41	43	45	47	49	10%	5%
Spotter	17	18	19	20	21	21	10%	4%
TOTAL	292	305	319	332	345	357	10%	4%

The turnover rate of 10% is an estimate, based upon information available to State personnel. It is believed that information of this nature would be more readily available were operators required to be registered and certified. In addition, a certification process could help raise the prestige and salaries within the profession, while providing individuals with an incentive to upgrade their skills through training processes.

Within the realm of resource recovery and hazardous waste management, future workforce levels are much more difficult to predict, because of the very recent passage of the Resource Conservation and Recovery Act of 1976. The area of resource recovery is expected to grow as a result of the Act, and because of an increased realization within the private sector that the process can cost less than the disposal of used materials and the purchase of new. New types of activities in hazardous waste handling will emerge within the State, but details are unknown at this time and are at least partially contingent upon federal regulations and funding levels.

D. Training and Certification

All new entrants within the Environmental Quality Control sector of the

Department of Health and Environmental Control receive a structured orientation and direct supervision from their supervisors. This is described more fully in the Appendix of this report.

Technical upgrade opportunities for solid waste personnel are severely limited, as EPA has discontinued all technical courses that had previously been available. To partially fill this void EPA Region IV has formed the Southeast Solid Waste Training Committee, with participants from all Region IV States, which critiques state training needs and provides training that is determined to be needed. Eight South Carolina persons attended the first of the courses offered, which was "Elements of Solid Waste Management". The State plans to continue participation in this group.

Personnel within the Solid Waste Management Division are each allowed one week of training per year by the Department. Managerial and administrative courses are utilized, as are technical short courses from universities, when available. One or two employees per year also attend the Environmental Management Institute at the University of Southern California. EPA fellowships for graduate education are not offered under EPA's Solid Waste Program, but other EPA Program Fellowships are used. In the past, State fellowships have been utilized by solid waste personnel, in combination with EPA fellowships, averaging approximately one per year.

The lack of technical training available in the field is seen by professionals as a severe deterrent to the utilization of the staff's full potential. The problem is especially severe, as few employees have had previous background in the field because of a lack of formal educational courses and programs oriented toward the field of solid waste. Little is offered at the graduate level, while virtually nothing is offered at the undergraduate level. This problem is expected to become much more acute, as the field is becoming increasingly technical, and resource recovery and hazardous materials management must be dealt with to a greater degree in the future. Currently, these fields are esoteric, and information is not being disseminated to the State level.

Federal funds are also currently not readily available for the training of those personnel engaged in solid waste disposal. Limited funds had been available until recently, and the Division held classroom and field training about once a month at six locations in the State. With ten to twelve participants at each session, mornings were spent in the classroom and during the afternoons, instructors demonstrated techniques at nearby landfills. Approximately 125 operators had participated in this activity, and curtailment was due to several reasons: a lack of funds, and the difficulty operators had in leaving their jobs for the training. Operator training now is conducted more informally by State training personnel, carried out with operators at their employment sites. Approximately 450 persons per year receive training of this type.

E. Career Potential

State officials project that professional representation within the Solid Waste Management Division will not alter appreciably within the next five years, except that increased expertise must be acquired in the areas of hazardous waste management, (especially with regard to organic materials), resource recovery, and traditional landfilling. How this expertise is acquired, e.g. through EPA technical courses or the hiring of new personnel, with previous training in the areas, is contingent upon what is available. The Solid Waste Management Division currently employs engineers, scientists and technicians.

It is expected that the numbers of landfill operators may slightly increase in the next five years, based upon recent trends. Additional expertise will also be required for these persons as the fields of hazardous waste management and resource recovery open up, both in terms of numbers and technologies for domestic and industrial operations. The informal training offered to operators is currently felt to be adequate for traditional disposal, but State personnel need to acquire additional expertise before training of operators in new subject areas can take place.

In sum, it appears that in the public and the private sectors, increased needs will occur for persons with experience and expertise in the fields dealt with in the Resource Conservation and Recovery Act of 1976. These needs will cover a broad realm, from technician level personnel to highly trained engineers.

F. Conclusion

A great expansion of activities in the field of solid waste in South Carolina is expected to occur in the public and private sectors as a result of the passage of the Federal Resource Conservation and Recovery Act of 1976. Until regulations are promulgated and States' roles defined the total impact cannot be projected. Based upon current information, it appears that workforce needs will rise significantly, and those with backgrounds in the field will be in great demand. Means to acquire expertise in the fields of resource recovery and hazardous materials are not readily available, and unless steps are taken to provide training for State, local and private personnel, the effectiveness of the State's future program could be severely limited.

Personnel within the State's Solid Waste Management Division also feel that the development of a certification procedure for operators could provide increased quality to the State's overall solid waste program. Operators would require increased skills in order to be certified, and the occupation would become more "professional" as a result.

VII. WASTE WATER

A. Introduction

Responsibility for South Carolina's wastewater program is charged to the State's Board of Health and Environmental Control by Act 1157, the Pollution Control Act of South Carolina, 1970, as amended by the 1971-1972 General Appropriations Act. This Act declares it to be the public policy of the State to maintain reasonable standards of purity of the air and water resources of the State, consistent with the public health, safety and welfare of its citizens, maximum employment, the industrial development of the State, the propagation and protection of terrestrial and marine flora and fauna, and the protection of physical property and other resources. Actual implementation of the State's wastewater program is carried out by the Environmental Quality Control Office (EQC) of the Department of Health and Environmental Control.

The law is designed to be in conformity with P.L. 92-500, the Federal Water Pollution Control Act, and according to a staff member of the State's Attorney General's Office, sufficient penalty provisions are provided in the Act to fine all who are out of compliance. Also according to this same person, the wastewater program in the Office of EQC is the strongest environmental program in the State, partially due to its longer existence, and because public concern is greater for water pollution control than it is for other environmental areas. The State has accepted primacy for carrying out the National Pollutant Discharge Elimination System (NPDES), which has been running quite smoothly, according to State administrators.

Act 1047 of 1966, amended by Act 175 of 1969, and further amended in 1972, created the South Carolina Board of Certification of Environmental

Systems Operators. Under this mandatory certification law, the plant classification/type, as defined by the Act, establishes the grade of certification required by the operator-in-charge of wastewater plants. Other technical operations personnel in the plants should be certified at equal or lower levels. The State Certification Board has responsibilities for establishing rules, regulations, and standards, and for administering the certification process, including developing and conducting formal examinations. On July 1, 1976, the last step required by the law, which provides for phasing in full mandatory certification, was completed.

When the requirements for 92-500 were first issued, officials within the Department felt that a doubling in staff would be required for carrying out all required responsibilities. After revised programs were underway, this estimate changed, and growth has not been dramatic, nor is it expected to be in the future unless federal requirements are drastically changed. The workforce needs associated with non-point source and toxic substances controls are not yet fully known but could well result in additional requirements greater than what is reflected in this analysis.

B. Workforce Profile

The Bureau of Wastewater and Stream Quality Control carries chief responsibilities in the State for wastewater pollution control. The Bureau of Field and Analytical Services, however, provides significant input and workforce in support of the program.

The Bureau of Wastewater and Stream Quality Control is organized into four Divisions as follows:

Domestic Wastewater Division: Receives and approves plans for municipal and community treatment facilities, and issues permits to construct and operate. Establishes NPDES parameters and takes part in the facility planning and construction process. Also accomplishes planning required by Section 201 of 92-500.

Compliance, Enforcement, and NPDES Administrative Division: Receives NPDES progress reports after permit issuance, performs the needed evaluations, and monitors progress. If facilities are not operating properly, this Division investigates.

Industrial - Agricultural Wastewater Division: Reviews and approves plans for industrial and agricultural treatment facilities, and issues the permits to construct and operate. Establishes NPDES parameters, and takes part in the facility planning and construction process.

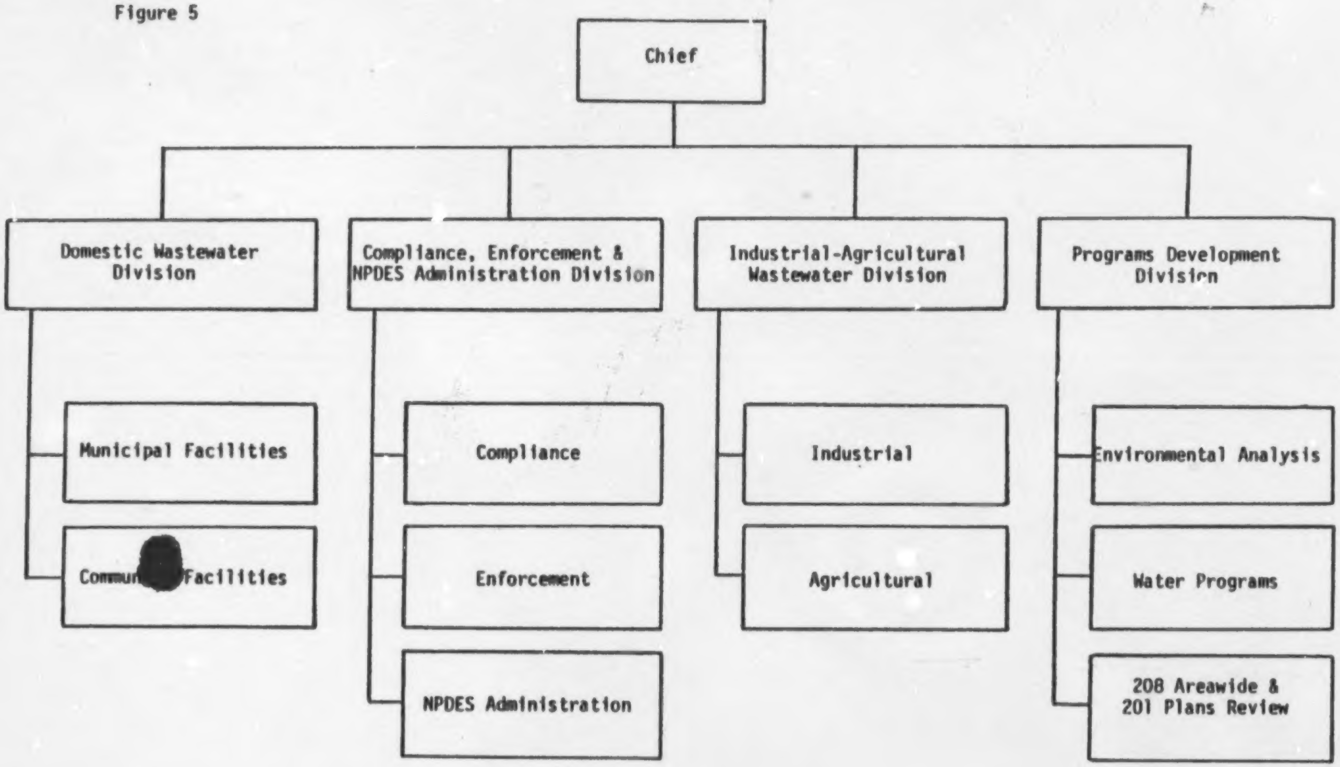
Programs Development Division: Accomplishes or directs planning required by Sections 201 and 208 of 92-500 and prepares Section 106 annual plans. Reviews Environmental Impact Statements and updates Section 303(e) basin plans.

The Analytical Services Division of the Bureau of Field and Analytical Services performs testing and monitoring as a check on wastewater treatment facilities through six regional labs and a central facility and performs monitoring of streams through sample collection stations. The Division of District Services of this same Bureau conducts monitoring and inspection of water and wastewater facilities through its twelve districts. This Division also monitors facility construction and issues the final permits for facilities to begin operation.

During 1976, the staffing levels within the Bureau of Wastewater and Stream Quality Control appear as follows:

SOUTH CAROLINA DEPARTMENT OF HEALTH AND ENVIRONMENTAL CONTROL
OFFICE OF ENVIRONMENTAL QUALITY CONTROL
BUREAU OF WASTEWATER AND STREAM QUALITY CONTROL

Figure 5


Chief
Domestic Wastewater Division
Compliance, Enforcement & NPDES Administration Division
Industrial-Agricultural Wastewater Division
Programs Development Division
Municipal Facilities
Commun[illegible] Facilities
Compliance
Enforcement
NPDES Administration
Industrial
Agricultural
Environmental Analysis
Water Programs
208 Areawide & 201 Plans Review

SOUTH CAROLINA DEPARTMENT OF HEALTH AND ENVIRONMENTAL CONTROL
OFFICE OF ENVIRONMENTAL QUALITY CONTROL
BUREAU OF FIELD AND ANALYTICAL SERVICES

Figure 6

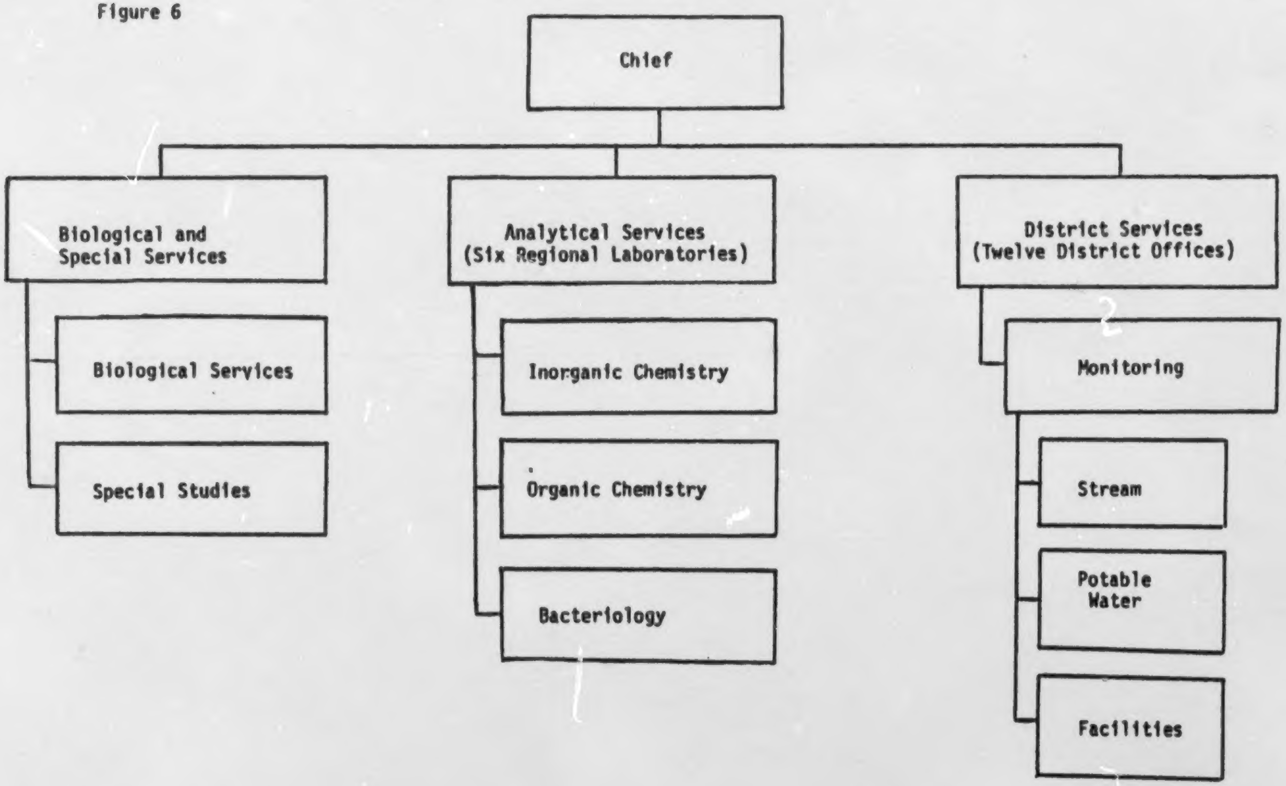

Chief
Biological and Special Services
Biological Services
Special Studies
Analytical Services (Six Regional Laboratories)
Inorganic Chemistry
Organic Chemistry
Bacteriology
District Services (Twelve District Offices)
Monitoring
Stream
Potable Water
Facilities

TABLE XII

SOUTH CAROLINA DEPARTMENT OF HEALTH AND ENVIRONMENTAL CONTROL

Bureau of Wastewater and Stream Quality Control
Current (1976) Staffing Level

Position	1976
Engineer	26
Scientist[1]	20
Other[2]	21
TOTAL	67

[1] Environmental quality managers with physical science degrees.

[2] Clerical and administrative support and nine environmental quality managers with non-physical science backgrounds.

Within the Bureau of Field and Analytical Services, it is estimated by Department administrators that approximately 60% of total effort in the Bureau is expended in activities related to wastewater. The following table depicts total numbers of persons currently employed within this Bureau:

TABLE XIII

SOUTH CAROLINA DEPARTMENT OF HEALTH AND ENVIRONMENTAL CONTROL

Bureau of Field and Analytical Services
Current (1976) Staffing Level

Position	1976
Division of District Services:	
Engineer	18
Technician	16
Other[1]	21
Division of Analytical Services:	
Chemist	16
Biologist	1
Microbiologist	9
Other[2]	37

(Table XIII continued on next page)

TABLE XIII (continued)

	1976
Division of Biological and Special Services:	
Biologist	7
Other Scientist[3]	4
Other	1
TOTAL	130

[1] Clerical support, administrative support, and five non-physical science environmental quality managers.

[2] Technicians, environmental quality managers, clerical and administrative.

[3] Environmental quality managers.

If 60% of time in this Bureau is spent in wastewater work, this suggests that approximately 78 person-years of effort are currently utilized in this field.

The "Environmental Quality Manager" series is quite broad, and all in it have at least a bachelor level degree. Those in the physical science area have degrees in areas such as biology, zoology, chemistry and microbiology, while those in the "other" categories represent non-physical science backgrounds such as business administration and sociology. These types of employee are fairly easy to recruit, as most schools in the State offer programs in these fields.

Engineers vary in type, but those in wastewater programs come mainly from environmental and sanitary engineering backgrounds. When master's level engineers are recruited, the Department especially seeks those with environmental systems backgrounds. Recruitment is not difficult as it was several years ago; this is primarily due to improved salary levels and to a lesser degree to the present state of the economy.

Most technicians come either from two-year technical schools or have high school educations with previous experience in the field, while others have bachelor-level degrees. The majority of these work in the district offices, and provide monitoring and enforcement support to the central office.

Five Councils of Government have been designated for planning activities under Section 208 of 92-500. Those designated are:

South Carolina Appalachian Council of Governments
Central Midlands Regional Planning Council
Waccamaw Regional Planning and Development Council
Berkely-Charleston-Dorchester Regional Planning Council
Lowcountry Regional Planning Council

These agencies perform water quality management planning for the twenty counties under their jurisdiction, while the Department provides this function for the balance of the State (26 counties).

There are approximately 1,600 wastewater facilities with NPDES permits in the State, of which approximately 25% are industrial, 25% municipal and 50% private (subdivisions, motels, restaurants, laundries, etc.). The numbers of persons employed at each facility ranges from 0 to 40. Approximately 900 of the facilities are lagoons that often require the presence of a part-time operator only who might be responsible for several such facilities.

Operators are certified according to the class of plant they are responsible for, the details of which are defined in the Act. The State utilizes seven major categories for certification of operators, Grades "A" through "D", with Grade "A" operators in charge of the most complex plants, and Grade "D" the least complex. Other categories include Grade "D-Lagoon", "Trainee Permit" and "No Grade". Lagoon certificates will be required for those that operate lagoons, only this classification will not be implemented until Fiscal Year 1978. Trainee permits are valid only for two years; those holding this permit must be under the supervision of a legally certified operator. This classification was included in order to facilitate the recruitment of new personnel. "No Grade" licenses were issued to those that worked in wastewater treatment plants at the time that the mandatory certification law went into effect. These people were not required to pass an examination in order to become certified, but cannot be operators-in-charge, nor can they relocate to other plants without becoming fully certified. One hundred and fifty of these were newly certified at the "D" level and 539 were upgraded from a lower certification level to grades "C", "B", and "A".

State district personnel with duties of inspecting wastewater treatment plants may be issued certificates qualified by the word "inspector" to indicate that they have fulfilled all requirements for certification with the exception of actual employment in a plant and at least one year's full-time experience as an operator in a wastewater treatment plant. As of November 15, 1976, fifteen persons were certified under this classification.

The Department currently does not hold the authority for the certification of wastewater labs. This authority, however, is currently being developed. The Certification Board has recently provided for the certification of technicians in wastewater labs. As of November, 1976, 24 persons held certificates in this category.

The following table depicts the numbers of operators of wastewater treatment plants holding active certificates in South Carolina as of November, 1976, as supplied by the Department of Health and Environmental Control.

TABLE XIV
SOUTH CAROLINA CERTIFIED WASTEWATER TREATMENT PLANT OPERATORS
Current (1976) Staffing Level

Classification	1976
A	222
B	286
C	572
D	420
D-lagoon	0
Trainee	584
No Grade	296
TOTAL	2,380

It can be readily seen from the table that the category with the largest number of personnel is the "trainee" group, which is nearly twice as large as the "No Grade" group. This suggests that a workforce expansion is occurring and/or many persons are leaving the profession and being replaced by newly-trained personnel. According to State administrators, both of these situations are occurring. The table also shows a greater number of persons certified in lower grades, with gradual increases upward. This reflects the greater number of lagoons and other facilities currently having less sophisticated treatment.

The Department of Health and Environmental Control, Environmental Quality Control, has developed a Manpower Requirements Management Information System. Basically the system, as conceived, designed and planned for implementation provides for a detailed physical inventory of workforce on hand and required at each treatment location, provisions for periodic update of the base data as changes occur on a monthly basis, and an annual update primarily through the use of a machine printout. An EPA grant plus State funds are committed to this project primarily for the pay and support of personnel. During Fiscal Year 1976, a revised system design, forms and collection technique was coordinated and subjected to initial testing and used in collecting and building a sample data base for use in machine programming, debugging and overall system check. Expanded field testing and initial implementation commenced in the last quarter of Fiscal Year 1976, and the Department expects to finalize an overall system design, complete field testing, debugging and necessary modifications by the end of Fiscal Year 1977 or early in Fiscal Year 1978, leaving full expansion and final implementation to be accomplished during Fiscal Year 1978. Subsequent to completion of the system, tentative plans are to expand to other appropriate environmental technical fields; the system should be made available to other states as well.

Information being gathered in survey form from public wastewater plants in the State includes the following:

Plant name
Plant Classification
District
Address
Type of treatment
Plant NPDES number
Plant personnel
Training received by personnel in the past twelve months
Type and location of training
Personnel terminated
Personnel gained
Total employees required (estimated), budgeted, and actually employed

For purposes of this survey, plant personnel are divided into the following categories:

1) Supervisory
    Superintendent, Management Level, etc.
2) Operator
    Operator-in-charge
    Operator
    Trainee
3) Laboratory Technician
    Chemist
    Biologist
4) Other Technical
    Maintenance Personnel
    Trainee
5) Other
    Laborer
    Administration
    Truck Driver

As of January 27, 1977, data from 420 wastewater plants had been collected. All sizeable domestic plants had been surveyed, but not all of the sizeable industrial plants. The number of personnel on hand in these 420 plants is, by category:

Supervisory:	324
Operator:	514
Laboratory Technician:	78
Other Technician:	128
Other:	61
TOTAL	1,105

Based upon available data, officials within the Office of Environmental Quality Control estimate that 3,500 to 4,000 persons are working in wastewater treatment plants in the State of South Carolina, and that positions occupied should be in approximately the same proportions as those found in the data that has been gathered, with the exception of the supervisory level. Utilizing the above assumptions, the following table depicts estimates of the total number of persons employed currently in wastewater treatment operations in the State:

TABLE XV

SOUTH CAROLINA WASTEWATER TREATMENT PLANT PERSONNEL
Current (1976) Staffing Level

Position	1976
Supervisor	600
Operator	2,248
Laboratory Technician	264
Other Technician	432
Other	206
TOTAL	3,750

Industries in South Carolina seem to have a general pattern of using engineering personnel for the supervision and management of wastewater treatment facilities, and to some extent for operations, according to professionals within the Office of Environmental Quality Control. Technicians are used as the normal operating workforce. Industries tend to have more certified operators than they require for operations probably in order to provide greater depth of coverage, thus minimizing the risk of temporarily falling out of compliance.

Larger industries utilize their own "maintenance and engineering" sections, which are responsible for effluent control, and in which most employees are certified. Smaller plants utilize one person who often performs wastewater control activities on a part-time basis. Most of the smaller industries do not set up a separate wastewater laboratory, but utilize other laboratories within the company or commercial labs on a contract basis.

Engineering consulting firms are utilized by both industries and municipalities for the design of treatment facilities. No cities in the State currently have their own engineering capability. For internal ongoing operations, the use of consulting firms has proven to be uneconomical.

C. Workforce Projections

It appears to State administrators that the technology and the workforce at the State level is currently adequate to meet the 1983 standards resulting from 92-500. Therefore, growth within the Department in the area of wastewater will be minimal, although shifts may take place in types of positions present, as engineers may to some extent be replaced by technicians from associate degree engineering programs, by environmental quality managers and/or by other four-year bachelor degree technicians (see Section A of this report for the potential impact of toxic substances and non-point sources).

The following table depicts the future workforce levels within the Bureau of Wastewater and Stream Quality Control, as projected by Environmental Quality Control administrators:

TABLE XVI

SOUTH CAROLINA DEPARTMENT OF HEALTH AND ENVIRONMENTAL CONTROL

Bureau of Wastewater and Stream Quality Control
Workforce Projections to 1982 (est.)

Position	1976	1977	1978	1979	1980	1981	%/annum turnover (average)	%/annum growth (average)
Engineer	26	26	26	26	22	22	6%	-3%
Scientist	20	20	21	21	23	23	6%	10%
Technician	0	0	0	0	2	2	9%	20%
Other	21	22	23	23	25	25	17%	4%
TOTAL	67	67	70	70	72	72		2%

Before Fiscal Year 1975, the rate of turnover was higher than it presently is. The decreases are attributed primarily to: a) the upward adjustment of pay scales starting in 1973, b) the offering of post-graduate opportunities on an expanded basis, and c) the economic recession.

Some increases in the Bureau of Field and Analytical Services are also projected, and are reflected in the following table:

TABLE XVII

SOUTH CAROLINA DEPARTMENT OF HEALTH AND ENVIRONMENTAL CONTROL

Bureau of Field and Analytical Services
Workforce Projections to 1982 (est.)

Position	1976	1977	1978	1979	1980	1981	%/annum turnover (average)	%/annum growth (average)
Engineer	18	18	18	18	18	18	6%	0%
Scientist	57	57	60	62	65	65	8%	3%
Technician	24	24	25	26	26	27	9%	2%
Other	31	31	31	32	32	32	17%	1%
TOTAL	130	130	134	138	141	142		2%

Projected increases within the Bureau, however, are not attributed to additional workload in the area of wastewater, but rather primarily to increased activities in the district offices and the laboratories in the field of water supply. While approximately 60% of the time in this Bureau is currently spent in work in the field of wastewater, this is projected to gradually decrease to approximately 50% in the next several years. Therefore, approximately 71 person-years will be spent in this Bureau by 1982, a slight decrease from current levels.

Administrators within the Department of Health and Environmental Control estimate an annual requirement of 200 wastewater entry level operators, due both to expansion and attrition, estimated at 30% to 40% due to expansion and the remainder due to attrition. Exactly what type of shifts that take place between classifications is difficult to determine at this time, although it is projected that the largest proportion will remain at the lower levels. An upward trend overall will occur, due to the construction of new complex facilities and the upgrading of existing facilities.

The number of certificates issued to laboratory technicians will necessarily grow due to more stringent requirements of the law. Within two years, it is projected that approximately 500 to 600 certified technicians will be required. In some cases, these will also be the operators of the plants. The number of State facility inspectors is not expected to grow as dramatically, however, projected at a maximum of 25% growth over the next five-year period.

The following table depicts present and future levels of certified operators, inspectors, and laboratory technicians, according to the best professional estimates of administrators within the Department:

TABLE XVIII

SOUTH CAROLINA WASTEWATER TREATMENT PLANT PERSONNEL

	Workforce Projections to 1982 (est.)						%/annum growth (average)
Position	1976	1977	1978	1979	1980	1981	
Operator	2,380	2,580	2,780	2,980	3,180	3,380	7%
Lab Tech.	24	250	500	600	600	600	212%
Inspector	15	16	17	18	19	19	5%
TOTAL	2,419	2,846	3,297	3,598	3,799	3,999	11%

D. Training and Certification

All new entrants into Environmental Quality Control receive a structured orientation and direct supervision from senior departmental employees within the Bureau. Upgrade training opportunities are offered to wastewater employees, and although EPA technical courses are offered, the combination of required tuition fees and State budgetary limitations prohibits as much usage of these courses by employees as is desired. University short courses are utilized as available, and several wastewater employees per year attend the Environmental Management Institute at the University of Southern California. Also to offset the lack of technical training that is able to be provided to employees, managerial and administrative courses are offered through in-house means, the Federal Civil Service Commission, universities and professional associations. Several employees per year are also able to take advantage of EPA and State fellowships for graduate-level training. The Department anticipates that stringent budget and expenditure controls as well as high EPA tuition rates will continue through Fiscal Year 1977. Local management and administrative training will continue to provide substitutions for technical training whenever practical. For more detail, refer to the Appendix of this report.

Training and educational opportunities are available to technician-level personnel working at wastewater facilities throughout the State, and often run hand-in-hand with offerings in the field of potable water. The types of training available to personnel are as follows:

1) A two-year environmental technology program (CEWT) leading to an associate degree is available at Greenville Technical College, with a normal classload of 15-20 students. This has been funded at decreasing levels by EPA through Fiscal Year 1977. Fiscal Year 1976 output was 17 graduates (potable and wastewater).

2) Eighty-hour Technical Education Systems Upgrade Programs are offered periodically at several technical schools, aimed at preparing operators for State certification. Training is also included for lab and other technicians, and is chiefly utilized by those already employed in technical positions. An EPA grant supported this program for the "C" and "D" levels through 1975. During Fiscal Year 1976, this was periodically offered by technical education centers as a normal program offering to be paid for by each individual student. There was a reduction at this time in output compared with that which was produced under the EPA grant: approximately 100 during Fiscal Year 1976 versus 539 in Fiscal Year 1975 for potable water and wastewater.

3) Clemson University offers correspondence courses that cover certification levels "A" through "D" in both potable water and wastewater. The courses offer basic training in such areas as operations, maintenance, and laboratory procedures. The estimated output for both potable water and wastewater in Fiscal Year 1976 is 272.

4) Clemson University's water and wastewater treatment plant operations training program sponsors short schools periodically during the year. The schools provide three-day basic operations reviews designed to prepare water and wastewater treatment plant operators for state certification examinations. Exams are given at the end of the short school. The water and wastewater output for Fiscal Year 1976 was 274.

5) Sacramento State College offers a correspondence course only in wastewater which is applicable to all grades but is best used for the "A" and "B" grades only. The Sacramento program is preparing a home-study course on wastewater collection systems. A course usually takes three to six months. Twenty individuals were state-supported during Fiscal Year 1976 at the A and B levels.

6) An NPDES training program was initiated during Fiscal Year 1976 using a combination of State and EPA grant funds. Two EPA-developed courses are offered, "Basic Laboratory Skills", and "Self Monitoring Procedures - Basic Parameters for Municipal Effluents", with the former used as a prerequisite into the latter. The program utilizes four technical colleges and a mobile van facility which is made available by EPA along with grant funds for its support. All NPDES permit holders were contacted by letter and invited to nominate their personnel to attend either an operator portion, a laboratory segment, or both. The large majority

> of permittees have responded favorably, and are sending personnel for training. The program is being presented in a self-paced mode, with the average student requiring about forty hours to demonstrate the capability to perform the required tests and actions. During Fiscal Year 1976, approximately 300 individuals will complete the program, leaving an estimated backlog of 300-600 to complete the program during Fiscal Year 1976.

The CEWT program is expected to continue after Fiscal Year 1977 without further support from EPA, with an annual output of 15 students. The Technical Education System Upgrade Program will also continue, with an expected output of 100 students during the year. Approximately 300 students are expected to participate in the Clemson short courses. Funds will not be available to support participation in the Sacramento State Correspondence course in Fiscal Year 1977. The NPDES program, however, will continue as presently operating but to do so, the Department feels that both the NPDES grant and the mobile van grant must be extended. Output is expected to be 300 to 600 students.

The Department anticipates applying for a grant of $250,000 under the authority provided by Section 109(b) of P.L. 92-500 during Fiscal Year 1977. These funds are to provide the nucleus needed to initiate a permanent operator training program encompassing a complete family of courses varying from two to three days on a special subject up to the two-year associate degree program.

E. Career Potential

Within the Office of Environmental Quality Control, only small overall increases in workforce levels are expected to occur within the next five years. Less need is expected to occur for engineering capabilities, as program emphasis will shift to operation and maintenance as opposed to new facilities. Because of this, one may gradually find an increased ratio of technicians with associate degrees, environmental quality managers and other technical personnel to graduate-level engineers. If educational programs were available, the Department would utilize bachelor-level persons, both generalists with broad-based knowledge and interest in environmental areas and specialists (engineers, chemists, biologists, etc.) who have likewise been trained in environmental areas. Generalists would readily fit into the "Environmental Quality Manager" series. At this point, there are virtually no educational programs of this nature available, and the Department anticipates utilizing the same types of bachelor-level persons that it currently employs. Two-year technician programs are available, although graduate output is at present quite low, so that industries are able to recruit most graduates because of their higher pay scales.

The Department estimates an annual need for 200 wastewater entry level operators. However, within the State, there is only one entry level operator training program. The graduates of this program are qualified to operate at the "A" and "B" levels. While some people are hired as laborers or laboratory assistants and take upgrade courses for becoming certified operators, entry level training is needed for the "C" and "D" levels. In sum, increased needs are expected to occur for operators at all levels, and for certified laboratory technicians.

F. Conclusion

Departmental administrators and officials believe that appreciable increases in wastewater staffing levels will not be needed for meeting the 1983 standards of the Federal Water Pollution Control Act*. The State's Pollution Control Act also provides the Department sufficient authority for carrying out its provisions, and major changes in activities or priorities are not anticipated. Although technical training is available through EPA, State budget limitations prevent their usage at the level desired.

The State requires that all operators in charge of wastewater treatment plants be certified at an equal or higher level than the plants in which they are employed. The largest portion of plants in the State are lagoons that require the presence of only a part-time operator. Increased workforce needs are anticipated at this level and at all higher levels due to an increasing number of facilities and the expansion of those already in existence. The Department is developing a Manpower Requirements Management Information System which will provide an inventory of all personnel employed in wastewater treatment plants, periodic updates of this information, and information for forecasting future workforce and training requirements. This system is anticipated to be completed during Fiscal Year 1978.

According to available information, it does appear that the training and educational opportunities for wastewater treatment operations personnel that are currently available in the State will not be adequate for training the total numbers projected to require training. The greatest lack is for the training of entry level personnel for the "C" and "D" grades, although an expansion of the present entry level training program for higher levels is also needed, according to Department officials.

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*with the possible exception of non-point source and toxic needs. The mix ratio is expected to change during the period to provide increased capability to monitor O&M activities and to assure compliance with standards.

VIII. ENERGY

A. Introduction

For its energy supply, South Carolina has chiefly relied upon imported oil and gas. However, some hydroelectric and nuclear power is produced within the State. Currently, approximately 35% of the State's electricity is provided by nuclear facilities and an expansion of nuclear generating capacity is planned.

In 1976, the Governor of South Carolina issued an Executive Order which established an Energy Management Office in the Office of the Governor. Among the duties prescribed to this Office by the Order are the following:

1) To serve as a data source, and research and statistical arm to the State;
2) To implement actions required by Federal and State statutes or regulations affecting energy policy and resources in the State;
3) To build a cadre of personnel, educated in the energy fields dealing with energy supplies, distribution and end use problems and their impacts, and the promotion and encouragement of recycling projects, solar energy projects, nuclear power and fuel applications, as well as other exotic energy programs deemed appropriate and practical;
4) To develop, implement and monitor energy conservation programs;
5) To develop and implement educational programs in energy use for the public;
6) To encourage and promote Federal and State research and development projects;

South Carolina is heavily impacted with nuclear facilities. For a complete listing, refer to the Radiation section. A Nuclear Advisory Council is charged by the State with the responsibility of assuring that the nuclear industry does not have a detrimental effect upon the State's citizenry. This Council advises the Governor and the General Assembly on nuclear developments within the State, and offers policy recommendations.

Energy-related research is principally carried out at the University of South Carolina. Researchers are carrying out a project funded by the Energy Research and Development Administration for forecasting the future of nuclear power across the United States, and its workforce impacts.

B. Workforce Profile

In the Energy Management Office are a director and eight other professionals, including statisticians, engineers and administrative personnel. The director of the Office has stated that the chief goal is to keep South Carolina supplied with adequate energy for industrial expansion. Currently the Office is also performing preliminary data collection for the Federal Energy Administration so that it will carry out the provisions of the Federal Energy Policy and Conservation Act (EPCA). The goal of the program to be carried out, as prescribed by the Act, is a reduction of five percent or more in the total amount of energy consumed in the State by 1980 from the projected energy consumption for that year. All states participating in this program are to develop energy conservation plans that include:

1) Mandatory lighting efficiency standards for public buildings (except buildings owned or leased by the United States);

2) Programs to promote the availability and use of carpools, vanpools and public transportation (except that no federal funds will be used to subsidize public transportation);

3) Mandatory standards and policies relating to energy efficiency to govern the procurement practices of such State and its subdivisions;

4) Mandatory thermal efficiency standards and insulation requirements for new and renovated buildings (except buildings owned or leased by the United States); and,

5) A traffic law or regulation which, to the maximum extent practicable consistent with safety, permits the operator of a motor vehicle to turn such vehicle right at a red light after stopping.

The Nuclear Advisory Council has eleven members. This Council meets approximately eighteen days per year. One member is a full-time staff person for the Council.

The Division of Economic Opportunity, of the Office of the Governor coordinates low-income weatherization projects through the allocation of federal funds to 17 Community Action Agencies in the State. These funds stem from the Federal Community Services Administration and were supplemented with Title X funds from the Economic Development Act. Besides weatherization, these agencies pay power bills in cases of emergency, help low-income persons obtain loans from the Farmer's Home Administration for repairing homes or purchasing new homes, and provide counseling or other services relating to fuel and energy shortages. One person in the State office provides coordination for these activities, who indicates that each Community Action Agency averages three carpenters and one energy coordinator for these programs. In addition, from one to fifty outreach workers are involved in energy-related activities in each office.

C. Workforce Projections

Sources indicate that under existing programs, the Energy Management Office is adequately staffed. When implementation of the provisions of

EPCA gets underway, additional staff will be required, particularly to institute and enforce building code standards. Projected increases include two engineers and one public relations person, possibly an educator.

Impact from this Act will also be felt in the private sector, according to State sources. The biggest impact will be due to the mandatory thermal efficiency for buildings, and skilled architects will be required to design buildings to meet the standards. Engineers will be required that are knowledgeable in efficient heating and cooling techniques. Highly skilled professionals will be required for designing energy-efficient appliances, for designing energy-efficient automobiles, and for assisting industries in achieving energy conservation.

The executive director of the Nuclear Advisory Council projects an increase of one staff professional within the next five years. This person would provide legal assistance to the Council.

The Division of Economic Opportunity indicates that an increase in federal appropriations may occur for energy-related programs, which would be geared towards crisis intervention, rather than weatherization. If this increase occurs, additional persons at the State level will probably not be hired, but more efforts of the existing staff would be channeled toward these programs. At the local level, workforce increases would possibly occur, mainly for such persons as outreach workers and fiscal officers.

D. Training and Certification

Significant amounts of training must be provided to staff personnel of the Energy Management Office because institutional curricula in the field of energy are scarce. Staff professionals are sent to workshops, special courses and seminars offered by various universities such as the University of South Carolina and Clemson University, and by Oak Ridge Associated Universities, by industries and trade organizations.

Recently the Federal Energy Administration funded a home energy saver's workshop program in the State. Craft teachers at all of the Technical Education Centers in the State have provided these workshops, which were offered three nights a week for a total of 90 days. Included were techniques of insulation, weather stripping and other weatherization techniques. In addition, the Office of Energy Management is working with the State Department of Education in developing workshops for children in energy conservation.

E. Career Potential

Few opportunities are expected to emerge at the State level, although in energy-related agencies the addition of several engineers, a public relations person and a person with a legal background is expected to be required. In local Community Action Agencies, increased federal funding may provide opportunities for outreach workers, fiscal officers and other social service personnel.

In the private sector, opportunities are projected for nearly every type of engineer, for scientists, and for architects. Few opportunities appear to be emerging for technician-level personnel except for those trained in the field of power plant management.

F. Conclusion

Presently, nine professionals work in the State's Energy Management Office. This Office will coordinate an energy conservation program under the Federal Energy Policy and Conservation Act, and it is anticipated that three additional professionals will be required when implementation begins. The Nuclear Advisory Council projects one additional staff member for legal assistance in the next five years. Additional personnel will not be required for energy-related programs in the Division of Economic Opportunities, although workforce impacts may occur at the local level. In the private sector, opportunities are projected for engineers, scientists and architects.

State professionals believe that an important component of energy conservation programs is public awareness and education. Home-owner energy saving workshops have been held throughout the State, and plans are underway to provide energy conservation workshops to school children.

Selected Post Secondary Institutions With Formal Environmental Energy Programs

On the following pages are detailed descriptions of two environmental curricula available at educational institutions in South Carolina. They are Trident Technical College in North Charleston which offers an A.S. degree in Nuclear Engineering Technology and Clemson University in Clemson which provides an Environmental Systems Engineering program on the M.S., M. Engr., and Ph.D. levels. The latter program is subdivided into seven areas of emphasis: Water Treatment Systems, Natural Systems, Planning and Management, Environmental Science, Air Pollution, and Environmental Systems Engineering.

Elsewhere in the state there are five technical colleges that provide environmentally related curricula. They include: Tri-County Technical College in Pendleton, Sumter Area Technical College in Sumter, Florence-Darlington Technical College in Florence, Aiken Technical Education Center, and Greenville Technical College.

Tri-County Technical College awards an associate degree to students who complete the Nuclear Engineering Technology program. Students are trained to become reactor operators after receiving relevant coursework and a year of work experience in nuclear generating plants. Aiken Technical Education Center also offers a two-year curriculum in the nuclear field.

Sumter Area Technical College allows students to earn an associate in Engineering Technology degree upon completion of the two-year program. The curriculum is intended to prepare students for environmental employment in various positions in governmental or private fields.

Florence-Darlington Technical College provides students with two environmental degree fields, one in Water and Wastewater Engineering Technology and the other in Nuclear Technology with a Reactor Operations option. Both programs offer an Associate of Science degree, however, students in the former program must complete six academic quarters while students in the latter program complete eight quarters with a cooperative phase which provides on-site practical experience.

Students at Greenville Technical College may qualify for an Associate in Applied Science degree in Chemical Technology. Students may also select an associate degree program in Wastewater Technology.

Each of these programs is designed to produce graduates capable of performing tasks in several environmental areas. Professional faculty and college publications were sources for this information.

SENIOR INSTITUTIONS

Clemson University
Clemson, South Carolina

Program: Environmental Systems Engineering (M.S., M.Engr., Ph.D.)

Hours required of major: Semester - (M.S./M.Engr.) 30*, (Ph.D.) no minimum*
Program Inception: 1961
Staff Size: Four professors, one associate professor, two assistant professors, forty-five graduate assistants (7 Ph.D.s)

Programs

Water Treatment Systems

Hours required for M.S./M.Engr.: 30
Program Inception: 1961
Enrollment: 25
Graduates (1976): 25
Placement: 23
Graduate Work (Ph.D.): 2

Natural Systems

Hours required for M.S./M.Engr.: 30
Program Inception: 1961
Enrollment: 5
Graduates (1976): 3
Placement: 3
Graduate Work (Ph.D.): 0

Planning and Management

Hours required for M.S./M.Engr.: 30
Program Inception: 1961
Enrollment: 5
Graduates (1976): 4
Placement: 4
Graduate Work (Ph.D.): 0

Environmental Science

Hours required for M.S./M.Engr.: 30
Program Inception: 1961
Enrollment: 1
Graduates (1976): 1
Placement: 1
Graduate Work (Ph.D.): 0

*With qualifying prerequisite degree

Air Pollution

Hours required for M.S./ M. Engr.: 30
Program Inception: 1961
Enrollment: 2
Graduates (1976): 1
Placement: 1
Graduate Work (Ph.D.): 0

Environmental Systems Engineering

Hours required for Ph.D.: No stated minimum
Program Inception: 1961
Enrollment: 10
Graduates (1976): 3
Placement: 3
Graduate Work (Post-doctoral): 0

Courses

Special Problems
Principles of Water Treatment Systems
Laboratory in Principles of Water Treatment
Design and Operation of Water Treatment Systems
Laboratory in Design and Operation of Water Treatment Systems
Integrated Problems in Water Treatment Systems
Air Quality Monitoring
Air Pollution Meteorology
Pollution of Aquatic Environment
Pollution of the Aquatic Environment Laboratory
Environmental Engineering Chemistry II
Environmental Engineering Chemistry Laboratory II
Ecological Models
Environmental Systems Engineering Seminar
Environmental Quality Case Study
Special Problems
Selected Topics in Environmental Engineering I
Selected Topics in Environmental Engineering II
Research
Doctoral Research
Environmental Engineering
Water and Wastewater Treatment Systems
Radioassay Techniques for Environmental Monitoring
Environmental Engineering Chemistry I
Environmental Engineering Chemistry Laboratory I
Water Resources Engineering

Trident Technical College
North Charleston, South Carolina

Program: Nuclear Engineering Technology (A.S.)

Hours required for major: Quarter - Major 105
Program Inception: 1972
Staff Size: Four Instructors (2 Ph.D.s, 2 M.S.s)
Enrollment: 12
Graduates (1976): 0
Placement: 0
Graduate Work: 0

Courses

General Chemistry I
Algebra & Trig. I, II
English Grammer & Composition I
Engineering Drawing I
Problem Solving
Consumer Economics
Physics I, II, III
Principles of Chemistry I
Analytical Chemistry I
Technical Report Writing
Radiological Safety I, II
Chemistry Engineering Calculations
Radiochemistry I
Analytical Geometry and Calculus I
Effective Speaking
Unit Operations I, II
Human Relations
Nuclear Instrumentation
Modern Physics I
Physical Chemistry I
Process Control I
Nuclear Reactor Safety

State Legislation

SOUTH CAROLINA GENERAL

TITLE:

Pollution Control Act of 1970
South Carolina Code

PURPOSE:

To create a Pollution Control Authority and to maintain reasonable standards of purity of air and water resources of the state consistent with public health, safety and welfare.

DEFINITIONS:

1. Person
2. Waters
3. Marine district
4. Sewage
5. Industrial waste
6. Other wastes
7. Pollution
8. Standard
9. Board
10. Sewage system
11. Treatment works
12. Disposal system
13. Outlet
14. Shellfish
15. Ambient air
16. Air contaminant
17. Source
18. Undesirable level
19. Emission
20. Environment
21. Effluent
22. Effluent limitations
23. Point source

ADMINISTERING AUTHORITY:

Board of Health and Environmental Control

AUTHORIZATIONS:

To issue regulations pursuant to the act regarding air and water quality standards;
To issue permits as required by the act;
To conduct studies concerning pollution control and abatement;

AUTHORIZATIONS (Cont'd):

To prepare general air and water pollution control plans;
To cooperate with federal and other environmental agencies;
To enter and inspect property in enforcement of the act;
To approve treatment facility construction and operation;
To establish water effluent limitations.

PROHIBITED ACTS:

To make environmental discharges except in compliance with permit;
To construct or operate disposal facility without permit;
To operate facility in violation of a permit;
To discharge in violation of ambient air quality standards.

EXEMPTIONS:

Air conditions solely within industrial boundaries of commercial or industrial plant.

PENALTIES:

General violations - fines of up to $10,000;
Willful violations - fines of from $500 to $25,000;
Money damages for any fish, wildlife or plant life destroyed.

SOUTH CAROLINA PESTICIDES

TITLE:

Pesticide Control Act
South Carolina Code

PURPOSE:

To provide for the regulation of registration, quality control, use and application of all pesticides within the state.

DEFINITIONS:

1. Active ingredient
2. Administrator (EPA)
3. Adulterated
4. Animal
5. Antidote
6. Certified applicator
7. Commercial applicator
8. Committee
9. Defoliant
10. Desiccant
11. Device
12. Director
13. Environment
14. Equipment
15. Establishment
16. Fungicide
17. Fungus
18. Herbicide
19. Imminent hazard
20. Inert ingredient
21. Ingredient statement
22. Insect
23. Insecticide
24. Label
25. Labeling
26. Misbranded
27. Nematode
28. Nematocides
29. Non-commercial applicator
30. Person
31. Pest
32. Pesticide
33. Pesticide dealer
34. Plant regulator
35. Private applicator
36. Produce
37. Producer
38. Protect health and the environment
39. Public Law 92-516
40. Registrant
41. Registration
42. Restricted use pesticide
43. Unreasonable adverse effects on the environment
44. Under the direct supervision of a certified applicator
45. Weed

ADMINISTERING AUTHORITY:

Division of Regulatory and Public Service Programs
Pesticide Advisory Committee

AUTHORIZATIONS:

- To require the registration of all pesticides;
- To declare categories of pests and pesticides;
- To issue regulations pursuant to the act regarding handling, use and labeling requirements;
- To license pesticide dealers;
- To establish applicator certification standards and issue applicator licenses;
- To issue stop-sale orders;
- To generally enforce the act.

CERTIFICATION OR LICENSING:

Private and commercial applicators of restricted-use pesticides must obtain license through a showing of competency of use, by examination. Classifications established including ground, aerial, manual.

PROHIBITED ACTS:

- To use restricted use pesticides without license or violate terms of a license;
- To fail to register or properly label pesticides;
- To engage in pesticide sales without a license.

EXEMPTIONS:

Physicians and veterinarians.

PENALTIES:

First offense - fine of up to $100 or 30 days in jail;
Second offense - fine of up to $500 or 60 days in jail;
Subsequent offenses - fine of up to $1,000 or 90 days in jail.

SOUTH CAROLINA POTABLE WATER

TITLE:

State Safe Drinking Water Act
South Carolina Code 32-1201

PURPOSE:

To safeguard and provide for the regulation of public water supplies of the state.

DEFINITIONS:

1. Board
2. Commissioner
3. Contamination
4. Cross-connection
5. Department
6. Person
7. Public water supply

ADMINISTERING AUTHORITY:

Board of Health and Environmental Control

AUTHORIZATIONS:

To issue regulations pursuant to the act regarding water supply standards and operations;
To approve and issue permits for waterworks construction and operation;
To require operators of appropriate grade certified at all facilities;
To enter premises in general enforcement of the act;
To issue emergency orders regarding imminent hazards;
To be the state lead agency in drinking water matters.

PROHIBTED ACTS:

To fail to comply with rules regarding clean water standards;
To fail to operate according to terms of the permit;

PROHIBITED ACTS (Cont'd):

To render public water supply unusable;
To fail to perform necessary monitoring;
To install or allow cross-connection with public and non-public supplies.

EXEMPTIONS:

Protected reservoir water supplies.

PENALTIES:

General violations - fines of up to $5,000;
Willful violations - fines of up to $10,000 or one year imprisonment.

SOUTH CAROLINA RADIATION

TITLE:

Atomic Energy and Radiation Control Act
South Carolina Code 1-400.11

PURPOSE:

To promote the development of atomic energy resources in the state and provide for the safety of such resources.

DEFINITIONS:

1. By-product material
2. Ionizing radiation
3. General license
4. Specific license
5. Atomic energy
6. Source material
7. Special atomic energy materials
8. Emergency

ADMINISTERING AUTHORITY:

State Development Board
State Department of Health
Technical Advisory Radiation Control Council

AUTHORIZATIONS:

To promote and assist private atomic energy facilities and resources;
To coordinate atomic energy industrial development;
To promote the state's role in atomic energy development;
To control and regulate radiation sources other than nuclear reactors;
To issue regulations pursuant to the act regarding transportation of materials and other matters;

AUTHORIZATIONS (Cont'd):

To register or license all ionizing radiation sources;
To issue orders concerning radiation emergencies;
To enter into cooperative arrangements with other state and federal agencies.

PROHIBITED ACTS:

To fail to register or license any ionizing radiation sources;
To violate other provisions of the act or regulations.

EXEMPTIONS:

Some radiation sources may be exempted by regulation.

PENALTIES:

Fines of from $100 to $400 or one year imprisonment.

NRC AGREEMENT STATE: Yes

TITLE:

Operator Certification Law
South Carolina Code

PURPOSE:

To provide authority for the certification of water and waste water treatment plant operators.

DEFINITIONS:

1. Public water treatment plant
2. Public waste water treatment plant
3. Operator
4. State health officer
5. Board
6. Certificate of Registration

ADMINISTERING AUTHORITY:

Board of Certification of Environmental Systems Operators

AUTHORIZATIONS:

To issue regulations pursuant to the act;
To assist in operator education programs;
To establish standards to issue certificates to operator personnel;
To classify all public water supplies and waste water treatment plants.

CERTIFICATION OR LICENSING:

All public water and waste water treatment plants must be operated by an operator of the proper classification certified in accordance with the act.

PROHIBITED ACTS:

To practice as an operator without proper certification;
To operate a public plant without properly certified personnel.

PENALTIES:

Fines of up to $100 or 30 days in jail.

Appendix

SOUTH CAROLINA DEPARTMENT OF HEALTH AND ENVIRONMENTAL CONTROL

Office of Environmental Quality Control

General Information

The Office of Environmental Quality Control of the South Carolina Department of Health and Environmental Control has responsibility for carrying out the State's air, potable water, solid waste and wastewater programs. The Office maintains policies and practices that apply to the entire Office, as developed and announced by the Deputy Director for Environmental Quality Control. In an effort to avoid duplication within the state report, general policies and practices considered relevant to this report are provided below, and have been divided into three major categories: Temporary Employment Programs, Office Organization, and Employee Training Opportunities.

Temporary Employment Programs

The Office of Environmental Quality Control receives the services of various numbers of interns through State programs, which have not been depicted in the workforce profiles or workforce projections in the respective sections of the report. These interns are college students that generally perform the duties of laboratory and environmental technicians. During the summer, the Office averages 45 students, while during the winter there are approximately eight to ten. During the summer, students work full-time, while those that work during the winter spend approximately sixteen hours per week on the job.

Office Organization

One major change is likely, and implementation has commenced, in terms of functionalization within the Office of Environmental Quality Control. The Field and Analytical Services Bureau, which has only recently been formed, presently performs functions in the areas of potable water, wastewater, solid waste and shellfish. Crosstraining is planned and implementation has started for potable water/wastewater and air/solid waste. This will necessarily spread to all areas. The exact nature of any further functionalization is uncertain at this time, but the Office might be organized into bureaus such as:

Planning and Programming
Compliance and Monitoring
Engineering
Field and Analytical Services (this could be broken down
further, into field and lab)

In this case, all bureaus would perform functions relating to all areas, i.e., air, wastewater. The general types of activities and the total number of personnel is not expected to be appreciably affected by changes of this nature.

Employee Training Opportunities

Staff development and training receive a high priority within the Department. A specific orientation for all new employees within the Office of Environmental Quality Control is held two or more times per year, during which time each person learns exactly what the Department and the Office do and how all personnel fit into its structure. Supervisors also follow a prescribed outline for individual employee orientation, and conduct periodic reviews of the new entrants' work. This complete orientation procedure lasts approximately six months.

A basic policy within Environmental Quality Control is that each individual is allowed one week of job-related training per year. First priority for this type of training goes to supporting basic job qualifications; second, to further enhancement of the current position of the employee; third, to other upgrade or expansion-type training. Longer term formal education opportunities are all subject to a Senior Selection Board review process which considers all eligible personnel, rather than just those assigned to a specific technical field or area. This review considers the individual's potential for future development within the Department and the environmental quality control field, demonstrated interest in an environmental career, and the individual's experience and likelihood of remaining with the Department.

The types of direct training available include professional/technical, managerial and administrative, and come from such sources as EPA, the Federal Civil Service Commission, university short courses, the Center for Disease Control, and the Federal Statistical Institute of the Department of Health, Education and Welfare. The bulk of the technical short courses that are available pertain to wastewater and air pollution. Until two years ago, two-thirds to three-fourths of the agency's professional and technical staff were able to attend EPA or other appropriate courses each year. Instead, the Department has arranged in-house and local college level short courses in the fields of management and administration, and limited technical, which partially offset the greatly reduced technical training provided previously by EPA. It is believed by State administrators that the lack of technical training, particularly covering new techniques and technologies, will reduce the effectiveness of the State's pollution control activities in the long run.

Six to nine individuals from throughout the Environmental Quality Control Office attend the Environmental Management Institute conducted by the Department of Public Administration at the University of Southern California. These courses are held three times each year. A college degree is a primary requisite to attend the course. An attendee receives twelve hours of graduate level credit from the University of Southern California; six to twelve of these are usually acceptable to other institutions.

Also in the area of formal education, three to four persons are able to attend graduate school full-time under EPA fellowships. Until FY 1977 the same situation obtained with State-supported fellowships. Also during 1976, several individuals from all elements of the Office of Environmental Quality Control attended graduate school under part-time EPA fellowships.

It is anticipated by administrators that stringent budget and expenditure controls within the State, as well as high EPA tuition rates will continue during 1977. As a result, it is expected that the level of job-related technical training will be reduced to less than 25% of that desired. Local management and administrative training will continue at about the same rate as in as in FY 1976. Individuals will again be sent to the Environmental Management Institute at the University of Southern California.

A staff development and program plan for all training will shortly be developed within the Office of Environmental Quality Control in which each position will be analyzed in terms of basic qualifications needed. The training needed for each incumbent to fully meet his/her position's requirements will also be identified. The third step will be to identify what additional training and education each individual would require to fully exploit his/her potential within the Office of Environmental Quality Control.

The greatest personnel problem identified within the Office is the greatly reduced ability to send personnel to technical courses needed to carry out all required responsibilities. This is due to the EPA tuition charges coupled with State budgetary controls. Management and administrative courses have been substituted, but do not fully meet all needs.